Chapter 10

10.2 (a) $$S_p^{\,2} = \frac{(n_1-1)\cdot S_1^{\,2} + (n_2-1)\cdot S_2^{\,2}}{(n_1-1)+(n_2-1)} = \frac{(7)\cdot 4^2 + (14)\cdot 5^2}{7+14} = 22$$

$$t_{STAT} = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{S_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{(42-34)-0}{\sqrt{22\left(\frac{1}{8}+\frac{1}{15}\right)}} = 3.8959$$

(b) $d.f. = (n_1 - 1) + (n_2 - 1) = 7 + 14 = 21$

(c) Decision rule: $d.f. = 21$. If $t_{STAT} > 2.5177$, reject H_0.

(d) Decision: Since $t = 3.8959$ is greater than the critical bound of 2.5177, reject H_0. There is enough evidence to conclude that the first population mean is larger than the second population mean.

10.4

$$(\bar{X}_1 - \bar{X}_2) \pm t\sqrt{S_p^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)} = (42-34) \pm 2.0796\sqrt{22\left(\frac{1}{8}+\frac{1}{15}\right)}$$

$$3.7296 \le \mu_1 - \mu_2 \le 12.2704$$

10.20 (a) $H_0: \mu_D = 0$ (where $\mu_D = \mu_1 - \mu_2$)
$H_1: \mu_D \neq 0$

	A	B	$D_i = A - B$	$D_i - \bar{D}$	$(D_i - \bar{D})^2$
C.C.	26	27	-1.00	0.22	0.05
S.E.	27	27	0.00	1.22	1.49
E.G.	19	21	-2.00	-0.78	0.60
B.L.	22	24	-2.00	-0.78	0.60
C.M.	22	25	-3.00	-1.78	3.16
C.N.	25	26	-1.00	0.22	0.05
G.N.	25	24	1.00	2.22	4.94
R.M.	25	26	-1.00	0.22	0.05
P.V.	21	23	-2.00	-0.78	0.60
			-11.00		11.56

$$\bar{D} = \frac{\sum D_i}{n} = \frac{-11}{9} = -1.22\ ,\ S_D = \sqrt{\frac{\sum (D_i - \bar{D})^2}{n-1}} = 11.56$$

The Test statistic is $t = \frac{\bar{D} - \mu_D}{\frac{S_D}{\sqrt{n}}}$ = -3.05

The critical value(s) is/are 2.31, -2.31.
Since the test statistic does not fall between the critical value(s), reject H_0. There is sufficient evidence to conclude that the mean ratings are different between the two brands.

(d)

$$\bar{D} \pm t_{\alpha/2} \frac{S_D}{\sqrt{n}}$$

The 95% confidence interval estimate is -2.15 $\leq \mu_D \leq \leq \mu_D \leq$ -0.30.

10.27 (a) 1- H_0: $\pi_1 = \pi_2$

H_1: $\pi_1 \neq \pi_2$

2- α=0.10

3-

$$Z_{STAT} = \frac{(p_1 - p_2) - (\pi_1 - \pi_2)}{\sqrt{\bar{p}(1-\bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$\bar{p} = \frac{X_1 + X_2}{n_1 + n_2}\ ,\ p_1 = \frac{X_1}{n_1}\ ,\ p_2 = \frac{X_2}{n_2}$$

$$\bar{P} = \frac{70+50}{80+80} = 0.75, P_1 = \frac{70}{80} = 0.875, P_2 = \frac{50}{80} = 0.625$$

Z_{STAT} = 3.65

4- Z_{STAT} < - 1.645 or Z_{STAT} > + 1.645

5- Since Z_{STAT} is in the rejection region, there is sufficient evidence to conclude that there is a significant difference between the two proportions.

(b)

$$(p_1 - p_2) \pm Z_{\alpha/2} \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$$

$0.1422 \leq \pi_1 - \pi_2 \leq 0.3578$

10.39

$$F_{STAT} = \frac{S_1^2}{S_2^2} = \frac{161.9}{133.7} = 1.219$$

10.40 The degrees of freedom for the numerator is 24 and for the denominator is 24.

10.41 α=0.05, n_1=25, n_2=25, $F_{0.05/2}$== 2.27

10.42

Since F_{STAT} = 1.2109 is lower than $F_{0.05/2}$ = 2.27, do not reject H_0. There is not enough evidence to conclude that the two population variances are different.

10.51 (a) c-1 = 3-1 =2

There is/are 2 degree(s) of freedom in determining the among-group variation.

(b) n-c = 18-3 = 15

There is/are 15 degree(s) of freedom in determining the within-group variation.

(c) n-1 = 18-1 =17

There is/are 17 degree(s) of freedom in determining the total variation.

10.52 (a) $SSW = SST - SSA = 210 - 60 = 150$

(b) $MSA = \frac{SSA}{C-1} = \frac{60}{3-1} = 30$

(c) $MSW = \frac{SSW}{n-c} = \frac{150}{18-3} = 10$

(d) $F_{STAT} = \frac{MSA}{MSW} = \frac{30}{10} = 3$

10.53 (a)

Source	***df***	***SS***	***MS***	***F***
Among groups	2	60	30	3.00
Within groups	15	150	10	
Total	17	210		

(b) $F_{2, 15} = 3.68$

(c) Decision rule: If $F > 3.68$, reject H_0.

(d) Decision: Since $F = 3.00$ is less than the critical bound 3.68, do not reject H_0.