5-38. 

a) \( f_{0.25,10} = 1.59 \)  

d) \( f_{0.95,10,5} = \frac{1}{f_{0.25,10,5}} = \frac{1}{1.89} = 0.529 \)

b) \( f_{0.10,24,9} = 2.28 \)  

e) \( f_{0.90,24,9} = \frac{1}{f_{0.10,24,9}} = \frac{1}{1.91} = 0.524 \)

c) \( f_{0.05,15} = 2.64 \)  

f) \( f_{0.95,15} = \frac{1}{f_{0.05,15}} = \frac{1}{3.22} = 0.311 \)

5-40. 
1) The parameters of interest are the variances of concentration, \( \sigma_1^2, \sigma_2^2 \).

2) \( H_0: \sigma_1^2 = \sigma_2^2 \).

3) \( H_1: \sigma_1^2 > \sigma_2^2 \).

4) \( \alpha = 0.05 \).

5) The test statistic is 

\[ f_0 = \frac{s_1^2}{s_2^2} \]

6) Reject the null hypothesis if 

\[ f_0 > f_{0.05,10,9} = 3.14 \]

7) \( n_1 = 11 \) \( n_2 = 10 \)  

\[ s_1 = 2.77 \quad s_2 = 2.41 \]

\[ f_0 = \frac{(2.77)^2}{(2.41)^2} = 1.32 \]

8) Since \( 1.32 < 3.14 \), do not reject the null hypothesis and conclude there is insufficient evidence to indicate \( \sigma_1^2 > \sigma_2^2 \).

5-41. 
1) The parameters of interest are the etch rate variances, \( \sigma_1^2, \sigma_2^2 \).

2) \( H_0: \sigma_1^2 = \sigma_2^2 \).

3) \( H_1: \sigma_1^2 \neq \sigma_2^2 \).

4) \( \alpha = 0.05 \).

5) The test statistic is 

\[ f_0 = \frac{s_1^2}{s_2^2} \]

6) Reject the null hypothesis if \( f_0 < f_{0.975,9,9} = 0.248 \) or \( f_0 > f_{0.025,9,9} = 4.03 \)

7) \( n_1 = 10 \) \( n_2 = 10 \)  

\[ s_1 = 0.422 \quad s_2 = 0.231 \]

\[ f_0 = \frac{(0.422)^2}{(0.231)^2} = 3.34 \]

8) Since \( 0.248 < 3.34 < 4.03 \) do not reject the null hypothesis and conclude the etch rate variances do not differ at the 0.05 level of significance.
b) 95% confidence interval:

\[
\left( \frac{s_1^2}{s_2^2} \right)^\frac{1}{2} f_{1-\alpha/2,\alpha/2, n_1, n_2 - 1} \leq \frac{\sigma_1^2}{\sigma_2^2} \leq \left( \frac{s_1^2}{s_2^2} \right)^\frac{1}{2} f_{\alpha/2,\alpha/2, n_1, n_2 - 1}
\]

\[
(0.35) \frac{3.55}{(0.40) 2.92} \leq \left( \frac{s_1^2}{s_2^2} \right) \leq (0.35)(0.40)
\]

\[
0.311 \leq \frac{\sigma_1^2}{\sigma_2^2} \leq 1.598
\]

We are 95% confident the standard deviations for the rod diameters are not significantly different.

The 95% confidence interval is wider than the 90% confidence interval.

c) 90% lower-sided confidence interval:

\[
\left( \frac{s_1^2}{s_2^2} \right)^\frac{1}{2} f_{1-\alpha/2, n_1, n_2 - 1} \leq \frac{\sigma_1^2}{\sigma_2^2}
\]

\[
(0.35) \frac{1.42}{(0.40) 1.06} \leq \frac{\sigma_1^2}{\sigma_2^2}
\]

\[
0.368 \leq \frac{\sigma_1^2}{\sigma_2^2}
\]

\[
0.406 \leq \frac{\sigma_1}{\sigma_2}
\]
1) the parameters of interest are the proportion of reported drug use, \( p_1 \) and \( p_2 \)
2) \( H_0: p_1 = p_2 \)
3) \( H_1: p_1 \neq p_2 \)
4) \( \alpha = 0.1 \)
5) Test statistic is

\[
z_0 = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}
\]

where

\[
\hat{p} = \frac{x_1 + x_2}{n_1 + n_2}
\]

6) Reject the null hypothesis if: \( z_0 \geq 1.645 \) or \( z_0 \leq -1.645 \)
7) \( n_1 = 500 \) \( n_2 = 500 \)
\( x_1 = 35 \) \( x_2 = 41 \)
\( \hat{p}_1 = 0.07 \) \( \hat{p}_2 = 0.082 \)
\( \hat{p} = \frac{35 + 41}{500 + 500} = 0.076 \)

\[
z_0 = \frac{0.07 - 0.082}{\sqrt{0.076(1-0.076)\left(\frac{1}{500} + \frac{1}{500}\right)}} = -0.72
\]

8) Since \(-1.645 \leq -0.72 \leq 1.645\), do not reject the null hypothesis and conclude that the data do not indicate a significant difference in the percentages of reported drug use for \( \alpha = 0.1 \).

\[
P-value = 2(1 - 0.235762) = 0.471524
\]

5.55. 95% confidence interval on the difference:

\[
(\hat{p}_1 - \hat{p}_2) - z_{\alpha/2} \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}} \leq p_1 - p_2 \leq (\hat{p}_1 - \hat{p}_2) + z_{\alpha/2} \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}
\]

\[
(0.07 - 0.082) - 1.96 \sqrt{\frac{0.07(1-0.07)}{500} + \frac{0.082(1-0.082)}{500}} \leq p_1 - p_2 \leq (0.07 - 0.082) + 1.96 \sqrt{\frac{0.07(1-0.07)}{500} + \frac{0.082(1-0.082)}{500}}
\]

\(-0.045 \leq p_1 - p_2 \leq 0.021\)

Since this interval contains the value zero, we are 95% confident there is no significant difference in the percentage of reported drug use.
1. average tensile strength
2. \( H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 \)
3. \( H_1 : \) at least 2 of the means are different
4. \( \alpha = 0.05 \)
5. \( F_0 = \frac{MS}{MS_E} \) ~ F with 4 and 5(4) = 20 df if \( H_0 \) true
6. Reject \( H_0 \) if \( F_0 > f_{0.05,4,20} = 2.87 \)
7. \( F_0 = \frac{475.76/4}{161.20/20} = \frac{118.94}{8.06} = 14.76 \)
8. Since 14.76 > 2.87, we reject \( H_0 \) and conclude that there are differences among the means. From examination of the data it appears that increasing cotton content up to 30% cotton increases strength but going to 35% cotton dramatically decreases strength.