10.5.

a. $\chi^2 = [(20-1)(20)^2]/300 = 25.3333$

If $\chi^2 > 30.1435$, reject H_o, otherwise do not reject H_o

Since 25.3333 < 30.1435 do not reject Ho and conclude that the population variance is less than 300

b. $\chi^2 = [(15-1)(367)]/300 = 17.1267$

Decision Rule:
If $\chi^2 > 21.0641$, reject H_o, otherwise do not reject H_o

Since 17.1267 < 21.0641 do not reject Ho

10.8.

Students need to select the alpha level. The solution assumes alpha = .05. If a different alpha level is selected, the critical Chi-square will change and the decision might be different. This represents a good opportunity to discuss the importance of thinking about the desired alpha level.

H_o: $\sigma^2 \leq 400$
H_a: $\sigma^2 > 400$

Using Excel's VAR function or manually compute $s^2 = 769.2746$

$\chi^2 = [(12-1)(769.2746)]/400 = 21.1551$

Decision Rule:

If $\chi^2 > 19.6752$, reject H_o, otherwise do not reject H_o

Since 21.1551 > 19.6752 reject Ho and conclude that the population variance is greater than 400

10.9.

a. H_o: $\mu = 0$
H_a: $\mu \neq 0$

Using Excel's AVERAGE and STDEV functions

$\bar{x} = 1.6667$ s = 4.9787

$t = (1.6667 - 0)/(4.9787/\sqrt{12}) = 1.1597$
$t_{.05/2} = \pm 2.2010$

Since t = 1.1597 < 2.2010 do not reject H_o and conclude that the average arrival time is on time. Because this is a t-distribution you must assume that the underlying population is normally distributed.

b. H_o: $\sigma^2 \leq 4$
H_a: $\sigma^2 > 4$

$\chi^2 = [(12-1)(4.9787)^2]/4 = 68.1655$

Decision Rule:
If $\chi^2 > 19.6752$, reject H_o, otherwise do not reject H_o

Since 68.1655 > 19.6752 do reject Ho and conclude that the population variance is greater than 4

c. From part a and b airlines should conclude that on the average the planes arrive on time but with variance greater than 4

10.18.

a. $s_1 = 2.8975$ $s_2 = 2.7033$

H_0: $\sigma_1^2 = \sigma_2^2$
H_A: $\sigma_1^2 \neq \sigma_2^2$

Using Appendix H with $D_1 = 9$ and $D_2 = 9$: If the calculated $F > 3.179$, reject H_0, otherwise do not reject H_0.

$F = 2.8975^2/2.7033^2 = 1.1488$
Since $1.1488 < 3.179$ do not reject H_0

b. Using Excel the p-value = 0.4198. Using the Appendix values we see the calculated F is less than the F for $\alpha = .05$ of 3.179. Therefore the p-value is greater than .05.

10.19.

H_0: $\sigma_d^2 = \sigma_w^2$
H_A: $\sigma_d^2 \neq \sigma_w^2$

Using Appendix H with $D_1 = 12$ and $D_2 = 8$: If the calculated $F > 3.284$, reject H_0, otherwise do not reject H_0

$F = 2^2/1.2^2 = 2.7778$

Since $2.7778 < 3.284$ do not reject H_o and conclude that there is no difference in the standard deviations

10.24.

H_0: $\sigma_1^2 = \sigma_2^2$
H_A: $\sigma_1^2 \neq \sigma_2^2$

a. If the calculated $F > 2.5769$, reject H_0, otherwise do not reject H_0

$F = 300^2/250^2 = 1.44$

Since $1.44 < 2.577$ do not reject H_0 and conclude that the standard deviations are equal

b. If the calculated $F > 3.905$, reject H_o, otherwise do not reject H_0

The conclusion does not differ

c. Use Excel's FDIST(1.44,13,13) which gives 0.26 which would be for a two-tailed test you would need an alpha of 0.26(2) = 0.52