**ChE 320\_Spr\_17\_HW 8 Solution**

**5-8**

88.85 92.54

1.5 1.2

n1 = 15 n2  = 20

a) 95% confidence interval:







With 95% confidence, the mean road octane number for formulation 2 exceeds that of formulation 1 by between 2.906 and 4.474.

b) 1) The parameter of interest is the difference in mean road octane number, and Δ0 = 0

2) H0:  or 

3) H1:  or 

4) The test statistic is



5) Reject H0 if z0<−zα = −1.645 or z0> zα = 1.645

6) 88.85 92.54

1.5 1.2

n1 = 15 n2  = 20



7) P-value =.

Because the P-value <0.05, reject the null hypothesis and conclude the mean road octane number for formulation 2 is significantly different from that of formulation 1 at α = 0.05.

**5-26**

a) 1) The parameter of interest is the difference in mean melting point, 

2) H0:  or 

3) H1:  or 

4) The test statistic is



5) Reject the null hypothesis if t0<where −= −2.021 or t0> where = 2.021

6)420.48 425, Δ0 = 0 

s1 = 2.34 s2 = 2.5 

n1 = 21 n2 = 21



7) Because −5.99 <−2.021 reject the null hypothesis and conclude that alloys do not have the same melting point at α = 0.05

b) P-value = 2P(t < -5.99), thus P-value < 0.0010

**5-32**

a)

The Minitab solution assuming equal variances follows:

**Two-Sample T-Test and CI: Approach 1, Approach 2**

Two-sample T for Approach 1 vs Approach 2

N Mean StDev SE Mean

Approach 1 8 1306 296 105

Approach 2 8 1219 196 69

Difference = mu (Approach 1) - mu (Approach 2)

Estimate for difference: 88

95% CI for difference: (-182, 357)

T-Test of difference = 0 (vs not =): T-Value = 0.70 P-Value = 0.497 DF = 14

Both use Pooled StDev = 250.9802

b) 95% confidence interval: t0.025,12 = 2.179







c)





The normal probability plot indicates that the two population variances may differ, so the pooled-*t* test may not be the best procedure to use. The results for the case of unequal variances follow.

**For unspooled t-test (optional**):

1) The parameter of interest is the difference in mean amount donated,.

2) H0: 

3) H1: 

4) The test statistic is





5) Reject the null hypothesis if t0<where −= −2.179 or t0>where −= 2.179

6) 1306 1219

296 196

n1 = 8 n2 = 8



7) P-value = 2P(t > 0.6931), thus 2(0.0025) < P-value < 2(0.005) = 0.005 < P-value < 0.010.

Because theP-value > 0.05, we fail to reject the null hypothesis. There is insufficient evidence to support aclaim that the two approaches differ at α = 0.05.

**5-40**

= 868.375 sd = 1290, n = 8 where di = brand 1 - brand 2

99% confidence interval:





−727.46 ≤μd≤ 2464.21

Because zero is contained within this interval, there is no significant difference between the two brands of tire.

**5-44**

1) The parameter of interest is the difference in tensile strength, μd where di =Strength Before - Strength After.

2) H0: μd = 0

3) H1: μd≠ 0

4) The test statistic is



5) Reject the null hypothesis if t0>where = -2.262 or t0>where = 2.262

6)9.5

1.841

10



7) P-value < 0.0005. Because the P-value < 0.05 we reject the null. There is evidence to indicate that the tensile strength before the aging process is not the same as the tensile strength after the aging process.

b) (7.608, 11.392) and because zero is not contained in this interval, evidence suggests that the two tensile strengths differ.

**5-50**

a) f0.25,5,10 = 1.59 d) f0.75,5,10 = 

b) f0.10,24,9 = 2.28 e) f0.90,24,9 =

c) f0.05,8,15 = 2.64 f) f0.95,8,15 =

**5-54**

1) The parameters of interest are the variances of concentration, 

2) H0:

3) H1:

4) The test statistic is



5) Reject the null hypothesis if f0>where = 3.14

6) 11 10

2.77 2.41



7) Because 1.32 < 3.14 fail to reject the null hypothesis. There is insufficient evidence to conclude that the two population variances differ at the 0.05 level of significance.

**5-90**

a) Normality and equality of variances assumptions appears to be reasonable. See the normal probability plot. The data appear to fall along a straight line and the slopes appear to be the same.





b) From Minitab, the test statistic is t0 = 4.22 and the P-value is 0.001. Because the P-value < 0.05, we reject H0.

c) From Minitab, the P-value is found to be 0.001

d)  

 

 

99% confidence interval:  where = 3.012









We are 99% confident the mean difference (first minus second test conditions) is between 1.40 and 8.36 (×106 PA). Because zero is not contained in the interval, H0 is rejected at  = 0.01. The test in part (b) rejected at  = 0.05 and the confidence interval shows that H0 is rejected even at the smaller significance level  = 0.01 so that the results are consistent with part (b).

**5-92**

a) 1) The parameter of interest is the mean weight loss, μd

where di = Initial Weight − Final Weight.

2) H0:

3) H1:

4) The test statistic is



5) Reject H0 if t0> tα,n-1 where t0.05,7 = 1.895.

6)





7) Because 2.554 > 1.895, reject the null hypothesis. There is evidence that the average weight loss is greater than 3 at α = 0.05.

b) 2) H0:

3) H1:

4) The test statistic is



5) Reject H0 if t0> tα,n-1 where t0.01,7 = 2.998.

6)





7) Because 2.554 <2.998, fail to reject the null hypothesis and conclude the average weight loss is not significantly greater than 3 at α = 0.01.

c) 2) H0:

3) H1:

4) The test statistic is



5) Reject H0 if t0> tα,n-1 where t0.05,7 =1.895.

6)





7) Because −1.986 < 1.895, fail to reject the null hypothesis and conclude the average weight loss is not significantly greater than 5 at α = 0.05.

Using α = 0.01

2) H0:

3) H1:

4) The test statistic is



5) Reject H0 if t0> tα,n-1 where t0.01,7 = 2.998.

6)





7) Because −1.986 < 2.998, fail to reject the null hypothesis and conclude the average weight loss is not significantly greater than 5 at α = 0.01.

**5-102**

a) The following plot for Mercedes indicates one point that is somewhat unusual. The plot for Volkswagen clearly displays one point that is very unusual. Because of the outliers the normal probability plots are not acceptable.





b) The normal probability plots are much better after the unusual observations are corrected. The data appear to fall along straight lines.



c) By correcting the data points, it is more apparent the data follow normal distributions. One observation can cause an analyst to reject the normality assumption.

d) 95% confidence interval on the ratio of the variances, 





Because the interval does not include 1, there is evidence to support the claim that the variability in mileage performance is greater for a Volkswagen than for a Mercedes at  = 0.05.