Stat 13

http://www.stat.ucla.edu/~dinov/courses_students.html

Suggested Chapter 11 Problems/Solutions

All Problems are from: Myra L. Samuels and Jeffrey A. Witmer,
Statistics for the Life Sciences, 3rd edition, Prentice-Hall (2003)

11.2: We have n* = 12, grand sum = 240 and y-bar = 240/12 = 20

11.2a: SS(between) = (4)(25-20)^2 + (3)(15-20)^2 + (5)(19-20)^2 = 180
SS(within) = (23-25)^2 + (29-25)^2 + … + (19-19)^2 = 72

11.2b: SS(total) = (23-20)^2 + (29-20)^2 + … + 19-20)^2 = 252
SS(between) + SS(within) = 180 + 72 = 252 = SS(total)

11.2c: df(between) = 2; MS(between) = 180/2 = 90;
df(within) = 9; MSD(within = 72/9 = 8;

s_{pooled} = sqrt[8] = 2.83

11.3a: SS(between) = SS(total) – SS(within) = 338.769 – 116 = 222.769
11.3b: df(between) = 2;MS(between) = (222.769)/2 = 111.3845
df(within) = 10; MS(within) = 116/10 = 11.6
s(pooled) = sqrt[11.6] = 3.406

11.4a:

Source	df	SS	MS	F
Between	3	135	45	1.602
Within	12	337	28.083	
Total	15	472		

11.4b: k = 3 + 1 = 4 (c) n* = 15 + 1 = 16

11.5a:

Source	df	SS	MS	F
Between	4	159	39.75	2.0205
Within	49	964	19.67	
Total	53	1123		

11.5b: We have df(between) = 4 = k –1, so k = 5

11.5c: We have df(total) = 53 = n* -1, so n* = 54

11.7: There is no single correct answer. Typical answers are:

11.7a:

	Sample 1	Sample 2	Sample 3
	1	2	3
	2	2	3
	3	3	3
	4	4	3
	5	4	3
y-bar	3	3	3

11.7b:

	Sample 1	Sample 2	Sample 3
	2	5	8
	2	5	8
	2	5	8
	2	5	8
	2	5	8
y-bar	2	5	8

11.8a:

Source	**df**	**SS**	**MS**
Between	2	136.12	68.06
Within	39	418.25	10.72
Total	41	554.37	

H_0**:** $\mu_1 = \mu_2 = \mu_3$ Numerator df=df(between)=2

H_A: The μ_i's are not equal Denominator=df(within)=39

$$F_s = \frac{MS(between)}{MS(within)} = \frac{68.06}{10.72} = 6.35$$

$\alpha = .05$ F(2,39) use F(2,40)

Table 10 http://socr.stat.ucla.edu/Applets.dir/OnlineResources.html#Tables gives 5.18 and 8.25, so .001<p-value<.01

The p-value (.001<p-value<.01) is $< \alpha = .05$; reject null hypothesis. Conclude that there is evidence of at least one different mean among diagnosed group.

11.8b: $S_{pooled} = \sqrt{MS(within)} = \sqrt{10.72} = 3.27$

11.8b: s_{pooled} = sqrt[10.72] = 3.27.

11.9a:

(a)

Source	df	SS	MS	F
Between	3	89.036	29.68	3.83
Within	44	340.24	7.73	
Total	47	429.3		

From F table http://socr.stat.ucla.edu/Applets.dir/OnlineResources.html#Tables with 3 and 40 dfs, 0.01 < p-value < 0.02, so the conc. of lymphocytes is not the same for the different stress levels.

11.9b: MS(within) = [11(2.77)2 + 11(2.42)2 +11(3.91)2 +11(1.45)2] / 44 = 7.73
so spooled = sqrt(7.73) = 2.78

11.11a: The null hypothesis is
H0: Mean time until alleviation of symptoms is the same in all three populations

11.11b: In symbols, the null hypothesis is H0: mu1=mu2=mu3

11.11c: k = 3, grand total n* = 262.

Source	df	SS	MS	F
Between	2	53.67	26.835	3.42
Within	259	2034.52	7.855	
Total	261	2088.19		

The test statistic is Fx = 26.835/7.855 = 3.42. With df = 2 and 140, Table 10 http://socr.stat.ucla.edu/Applets.dir/OnlineResources.html#Tables

gives us .02 < P-value < .05.
Thus we reject H0.

There is sufficient evidence (.02 < P-value < .05) to conclude that mean time until alleviation of symptoms is not the same in all three population.

11.11d. s_{pooled} = sqrt[MS(within)] = sqrt[7.855] = 2.80

H0: Mean MAO is the same for all three diagnoses (mu1 = mu2 = mu3)
HA: Mean MAO is not the same for all three diagnoses (the mu's are not all equal).

Here k = 3, n* = 42.

Source	df	SS	MS	F
Between	2	136.12	68.06	6.35
Within	39	418.25	10.72	
Total	41	554.37		

With df = 2 and 40 (the closest value to 39), Table 10
http://socr.stat.ucla.edu/Applets.dir/OnlineResources.html#Tables
gives .001 < P-value < .01. Thus we reject H0. There is sufficient evidence (.001 < P-value < .01) to conclude that the mean MAO is not the same for all three diagnoses.

11.40a:
H0: The three classes produce the same mean change in fat free mass (mu1 – mu2 = mu3)
HA: At least one class produces a different mean (the mu's are not all equal).

11.40b:

Source	df	SS	MS	F
Between	2	2.465	1.2325	0.64
Within	26	50.133	1.9282	
Total	28	52.598		

The test statistic is Fs = 1.2325/1.982 = 0.64. With df = 2 and 26, the test statistic is off the chart Table 10 http://socr.stat.ucla.edu/Applets.dir/OnlineResources.html#Tables; that is, P-value > 0.20). Thus we do not reject H0. There is insufficient evidence (P-value > 0.20) to conclude that the population means differ.

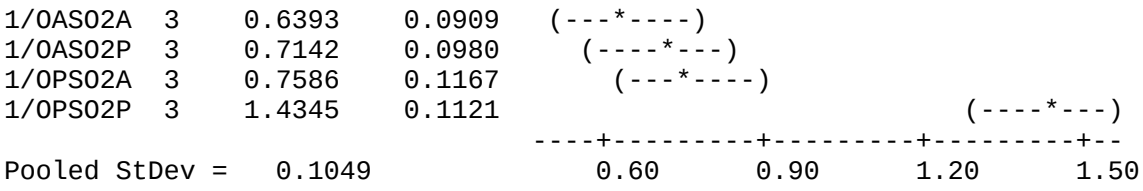
11.48a:

1. ozone absent, sulfur dioxide absent;
2. ozone absent, sulfur dioxide present;
3. ozone present, sulfur dioxide absent;
4. ozone present, sulfur dioxide present.

output looks like this

One-way Analysis of Variance

```
Analysis of Variance
Source     DF        SS        MS        F        P
Factor      3    1.2224    0.4075    37.01    0.000
Error       8    0.0881    0.0110
Total      11    1.3105
                                  Individual 95% CIs For Mean
                                  Based on Pooled StDev
Level     N      Mean     StDev  ----+---------+---------+---------+--
```


1/OASO2A 3 0.6393 0.0909
1/OASO2P 3 0.7142 0.0980
1/OPSO2A 3 0.7586 0.1167
1/OPSO2P 3 1.4345 0.1121
Pooled StDev = 0.1049
0.60
0.90
1.20
1.50