Homework 7 - Aparajita Rana

12.31 a)

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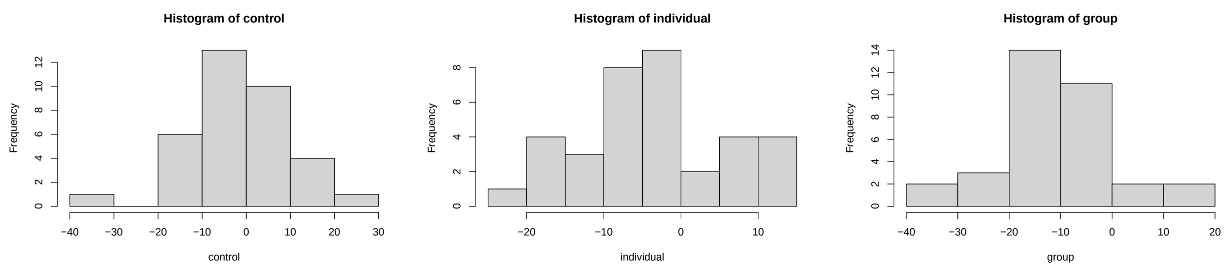
##             Sample Size     Mean Standard Dev
## Control         35.0000  -1.0086      11.5007
## Individual      35.0000  -3.7086       9.0784
## Group           34.0000 -10.7853      11.1392
```

b) Yes it is reasonable to pool the variances because the std dev of the individual (9.0784) times 2 is greater than the group std dev (11.1392)

c) We can conclude the sample means are approximately normal. The are not exactly normal because of the varied distribution but the sizes hover around 34 so we can say it is approximately normal.



12.32 a)

12.32

a) $H_0 = \mu_1 = \mu_2 = \mu_3$ $\quad \bar{X} = \frac{(35 * -1.0086) + 35(-3.7) + 34(-10.78)}{104}$

$H_a = \mu_1 \neq \mu_2 \neq \mu_3$

$\bar{X} = -5.1135 \rightsquigarrow SSB = \sum_{i=1}^{3} n_i (\bar{X}_i - \bar{X})^2 = 1,752.5945$

$SSE = \sum_{i=1}^{3} (n_i - 1)s_i^2 = 11,393.7358$

degrees of freedom: ~~...~~ = 2

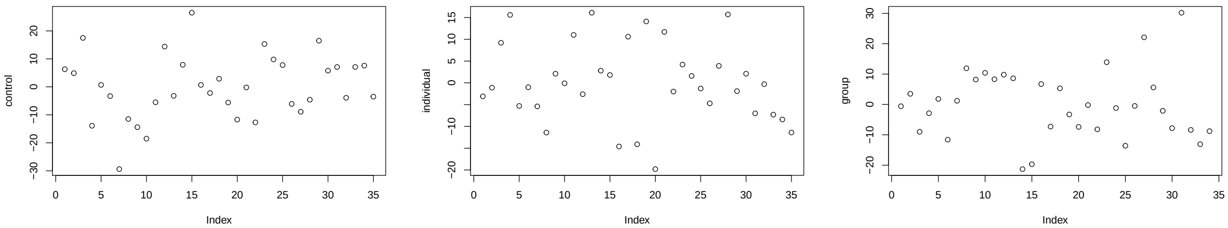
$P(F > 7.7) = 1 - pf(7.71, 2, 101)$

$0.00007 < 0.05$

the p-value is less than 0.05 we reject H_0 so we may accept H_a, μ_1, μ_2, and μ_3 are not all equal!

Source	df	SS	MS	F stat	p-val
Group	2	1752	876	7.76	0.0007
Error	101	11,393	112		
Total	103	13,146			

b) We plot the difference between the original and mean values. Control Mean = -1.0, Individual Mean = -3.7, Group Mean = -10.8



Control is mostly around y=0 while Group and Individual are more spread out. c)

c) $T_{i,j} = \dfrac{\bar{X}_i - \bar{X}_s}{\sqrt{S_p^2\left(\frac{1}{n_i}+\frac{1}{n_j}\right)}}$ $= S_p^2 = \dfrac{SSE}{n-k} = 112.8049$

ind - control = |-1.06|
ind - group = |-2.76711|
cont - group = |-3.8228|

df . $n-k = 104-3 = 101$ → ind - control = 0.2901
ind - group = 0.00672
control - group = 0.0002283

LSD = 0.29 > 0.05 we can't reject $\mu_{indiv} = \mu_{control}$ (ind - control)
0.0067 < 0.05 - reject H_0 $\mu_{ind} \neq \mu_{group}$ (ind - group)
0.00022 < 0.05 - reject H_0 $\mu_{con} \neq \mu_{group}$ (control - group)

d) Based on the first test, we see there are different mean. The LSD test shows that we reject H_0, means are ≠.

H_0, means are ≠.

12.33 a) Divide by 2.2

Groups	Sample Size	Mean	Std. Dev
Control	35	-0.45	5.22
Indiv	35	-1.6	4.12
Group	34	-4.9	5.06

b)

Source	df	SS	MS	F stat	p-val
Group	2	362.1	181	7.7648	0.00072
Error	101	2,354	23.3		
Total	103	2,716			

Nothing has really changed, same conclusion.

12.41 - Writing Contrasts

$\mu_1, \mu_2, \mu_3, \mu_4 \rightarrow$ blue, brown, gaze down, green

a) $\psi_1 = \mu_2 - \dfrac{(\mu_1 + \mu_4)}{2}$ b) $\psi_2 = \dfrac{(\mu_1 + \mu_2 + \mu_4)}{3} - \mu_3$

12.42 - Analyzing Contrasts

a) ~~$H_0 : \psi_1 \neq 0$~~ $\psi_1, H_0 : \psi_1 = 0$

$\psi_1, H_a : \psi_1 \neq 0$

$\psi_2, H_0 : \psi_2 = 0$

$\psi_2, H_a : \psi_2 \neq 0$

b) $c_1 = 3.72 - \dfrac{(7.05)}{2} = 0.195$

$c_2 = \dfrac{3.72 + 3.19 + 3.86}{3} - 3.11 = 0.48$

c) $S_p = \sqrt{\dfrac{(66)(1.85)(2) + \ldots}{(66) + \ldots}} = 1.68 \approx 1.7$

$SE_{c_1} = 1.68 \times \sqrt{\dfrac{1}{37} - \dfrac{0.25}{67} - \dfrac{0.25}{77}} = 0.309$

$SE_{c_2} = 1.68 \times \sqrt{\dfrac{1/9}{67} + \dfrac{1/9}{37} + \dfrac{1/9}{77} + \dfrac{1}{41}} = 0.2933$

d) $t_1 = \dfrac{c_1}{SE_{c_1}} = 0.631$

$df = n - k = 218$

$\underbrace{p\text{-val}} = 0.5237 > \underbrace{0.05}_{a}$

We fail to reject H_0 because p-val > 0.05.

e) $c_1 = 0.195 \pm (0.309 \times 1.96) = (-0.4106, 0.80064)$.

$c_2 = 0.48 \pm (1.96 \times 0.293) = (-0.09428, 1.05428)$