Theodore Jagodits / HW #6 / MA 331

I pledge my honor that I have abided by the Stevens Honor System

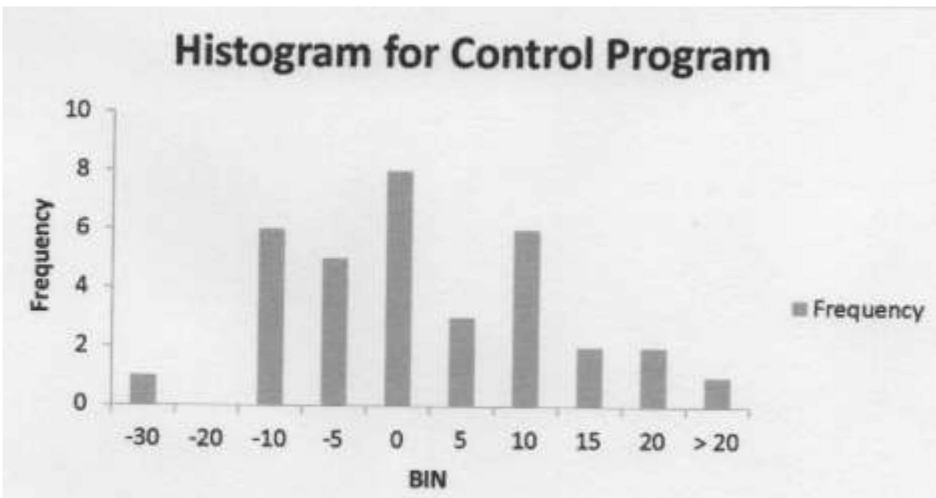
<u>12.31</u>

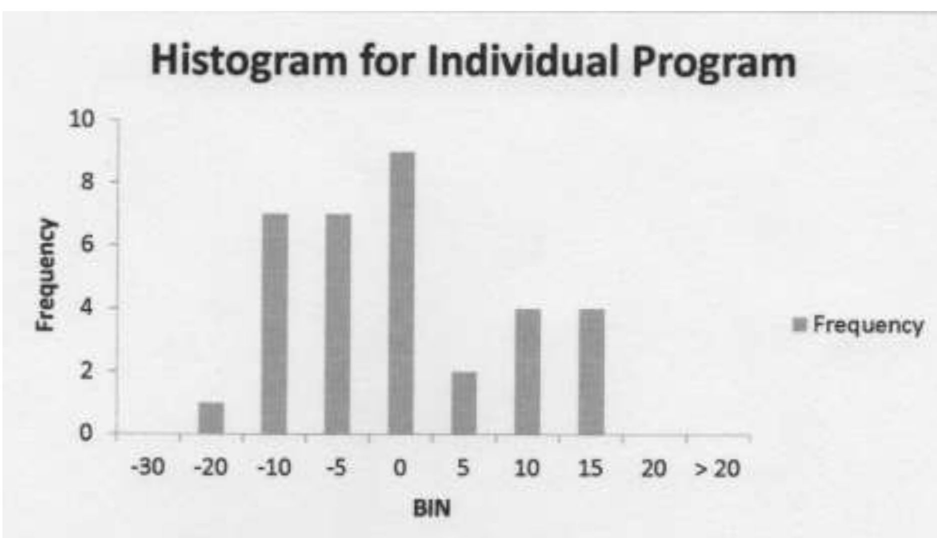
a)

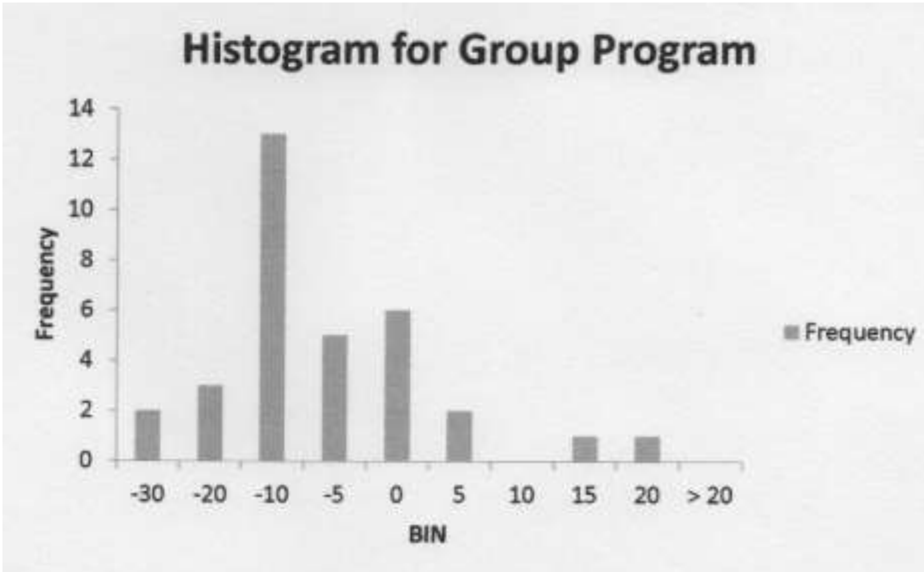
Group	Sample Size	Mean	Standard Deviation
Control	35	-1.01	11.50
Individual	35	-3.71	9.08
Group	34	-10.79	11.14

b) Yes, it is fine to pool variances 2 * 9.08 = 18.16 > 11.50

c)







The control group is the only one with a symmetric distribution. The other two groups have a left skew in their distribution. Since the sample sizes are large enough that we can say that they are approximately normal distributed we can neglect any discrepancies in the normal model.

<u>12.32</u>

a) The test statistic, p value, and degrees of freedom are in the table. Since the P-value is than 0.05, we can reject the null hypothesis, that there is no difference between the means of the different groups. So we can conclude that there is at least one mean different than the others.

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
CONTROL	35	-35.3	-1.00857	132.2667
INDIVIDUAL	35	-129.8	-3.70857	82.41669
LOSS	34	-366.7	-10.7853	124.0807

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1752.604	2	876.3018	7.767885	0.000728	3.086371
Within Groups	11393.9	101	112.8109			
Total	13146.5	103				

c)

Least-Significant Difference method is this equation:

LSD = t * sqrt(MSW * (1/N1 + 1/N2 + 1/N3))

I used excel to calculate the critical value (T.INV.2T(0.05,101) with an alpha of 0.01 and 101 degrees of freedom. T = 1.98

The MSW is 112.8109 and corresponds to the sample sizes of each group.

LSD = 6.187

And the difference between the means of the group and the individual groups is 7.-8.

Since 6.1 < 7.08, we can conclude that there is statistical significance and that there is a difference between the mean values of each group.

<u>12.33</u>

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
CONTROL	35	-16.04545455	-0.458441558	27.32782832
INDIVIDUAL	35	-59	-1.685714286	17.02824154
LOSS	34	-166.6818182	-4.902406417	25.63650543

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	362.1081921	2	181.054096	7.767884894	0.000727842	3.086371219
Within Groups	2354.111055	101	23.30803024			
Total	2716.219247	103				

After doing the math in kilograms instead of pounds, nothing really changed. The test statistic, degrees of freedom and p-value stayed the same. The entire data set was changed by a constant so nothing changed the actual statistic, moreover it just changed the means to different values but did not change the statistics. We conclude again the alpha is 0.001 and that we reject the null hypothesis

<u>12.41</u>

a) $\psi_1 = \mu_2 - \frac{(\mu_1 + \mu_4)}{2}$

b) $\psi_2 = \frac{(\mu_1 + \mu_2 + \mu_4)}{3} - \mu_3$

<u>12.42</u>

Group	Sample Size	Mean	Standard Deviation
Blue	67	3.194	1.755
Brown	37	3.724	1.715
Down	41	3.107	1.525
Green	77	3.860	1.666

$\text{Ration} = \frac{\text{max. std. dev.}}{\text{min. std. dev.}} = \frac{1.755}{1.525} = 1.15$

$1.15 < 2$ we can calc. pooled std. dev.

$$S_{pooled} = \sqrt{\frac{(n_1-1)(s_1)^2 + (n_2-1)(s_2)^2 + (n_3-1)(s_3)^2 + (n_4-1)(s_4)^2}{(n_1-1)(n_2-1)(n_3-1)(n_4-1)}}$$

a) 1^{st} sample contrast $H_0: \psi_1 = 0$

$H_A: \psi_1 \neq 0$

2^{nd} sample contrast $H_0: \psi_2 = 0$

$H_A: \psi_2 \neq 0$

b) $c_1 = \bar{x}_2 - \left(\frac{\bar{x}_1 + \bar{x}_4}{2}\right) = .197$ $\quad c_2 = \frac{\bar{x}_1 + \bar{x}_2 + \bar{x}_4}{3} - \bar{x}_3 = .486$

c) $SE_1 = 1.68 \sqrt{\frac{1^2}{37} + \frac{(-\frac{1}{2})^2}{67} + \frac{(-\frac{1}{2})^2}{77}} = .3098$

$SE_2 = 1.68 \sqrt{\frac{(\frac{1}{3})^2}{67} + \frac{(\frac{1}{3})^2}{37} + \frac{(\frac{1}{3})^2}{77}} = .2933$

d) $t_1 = \frac{c_1}{SE_1} = \frac{0.197}{0.3098} = 0.64$ $\quad df_n = 4-1 = 3$

$df_d = 222-4 = 218$

$\text{pvalue} = \text{tdist}(0.64, 218, 2) = 0.523$

the P is large, so we fail the H_0

we conclude there is not enough evidence to support that the average score of brown eyes differs from the other average eye colors.

$t_2 = \frac{c_2}{SE_2} = \frac{0.486}{0.2933} = 1.66$ $df_n = 3$ $df_d = 218$ ~~tdist(0.~~ $= 0.523$

Pvalue tdist(1.66, 218, 2) = 0.0983

P is is large, so we fail to reject the H_0. We can conclude there is not enough evidence to support that the average score when the model is Funny you vs. the score when looking down are different.

95% CI   d.f. = 222 − 1 = 221

$\psi_1 = 0.197 \pm (1.9707)(.3048)$
CI = [−0.41, 0.80]

$\psi_2 = 0.486 \pm (1.9707(.2933)$
CI = [−0.09, 1.06]