I pledge my honor that I have abided by the Stevens Honor System. -Ming Lin

12.31: Page 1172

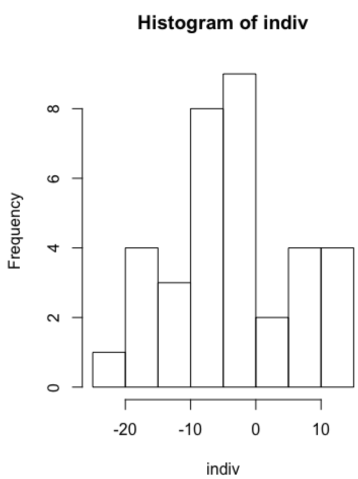
(a)

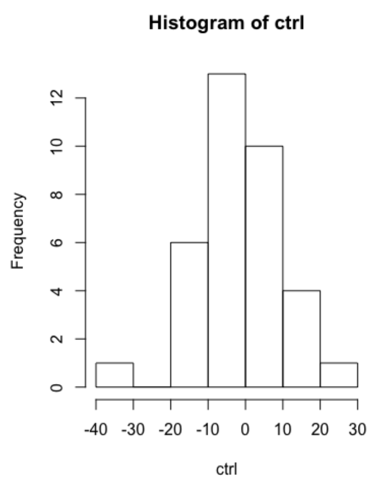
Groups	Sample Size	Mean	Std. Deviation
Control	35	-1.0086	11.5007
Individual	35	-3.7086	9.0784
Group	34	-10.7853	11.1392

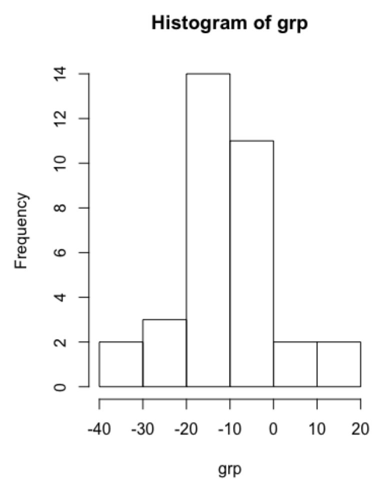
(b)

It is reasonable to pool the variance because $2 * 9.0784 = 18.1568 > 11.5007$

(c)







We feel confident that the sample means are Normal because based on the histograms we can tell that the sample mean is nearly normal. This is because looking at the histogram you can see that the chart for individuals is skewed to the right and the chart for control is distributed symmetrically. Lastly, the same sample is approximately 34 and is not distributed normally.

12.32: Page 1172

(a)

$H_0 : \mu_1 = \mu_2 = \mu_3$ versus H_a : they are not all equal.

$$
\begin{aligned}
\overline{X}_{.,.} &= \frac{(35(-1.0086) + 35(-3.7086) + 34(-10.7853)}{104} \\
&= -5.1135 \\
SSB &= \Sigma_{i=1}^{3} n_i(\overline{X}_{i,.} - \overline{X}_{.,.})^2 \\
&= 1752.5945 \\
SSE &= \Sigma_{i=1}^{3} (n_i - 1)S_i^2 \\
&= 11393.9358 \\
f &= \frac{\frac{SSB}{k-1}}{\frac{SSE}{n-k}} \\
&= 7.7678 \\
df &= 2 \\
P(F > 7.7678) &= 1 - pf(7.7678, 2, 101) = 0.0007278958 << 0.05 = \alpha
\end{aligned}
$$

Source	df	SS	MS	F statistic	p-value
Group	2	1752.5945	876.2973	7.7678	0.0007278958
Error	101	11393.9358	112.8112		
Total	103	13146.5303			

Because p-value is less than the significance level(0.05), we reject H_0

(b)

???

(c)

$$
\begin{aligned}
T_{i,j} &= \frac{\overline{X}_{i,.} - \overline{X}_{j,.}}{\sqrt{S_p^2(\frac{1}{n_i} + \frac{1}{n_j})}} \\
S_p^2 &= \frac{SSE}{n-k} = 112.8019 \\
Individual - Control &= |-1.0634| \\
Individual - Group &= |-2.7671| \\
Control - Group &= |-3.8228|
\end{aligned}
$$

$$P(|T_{i,j}| > |t_{i,j}|) = 2[1 - pt(|t_{i,j}|, n-k)] < \alpha$$
$$n - k = 104 - 3 = 101$$
$$Individual - Control = 0.2901365$$
$$Individual - Group = 0.006727696$$
$$Control - Group = 0.0002283676$$

LSD method:

Individual-Control, $0.2901365 > 0.05$, therefore, we fail to reject H_0 saying that $\mu_{individual} = \mu_{control}$.

Individual-Group, $0.0067276965 < 0.05$, therefore, we reject H_0 saying that $\mu_{individual} \neq \mu_{group}$.

Control-Group, $0.0002283676 < 0.05$, therefore, we reject H_0 saying that $\mu_{control} \neq \mu_{group}$.

(d)

Based on the test in part A, it shows that the means are different among each group. Using the results from part C shows that the outlier causing the means to be different in part A was the group-incentive program as individual and control both had equal means, but in both of the group-incentive pairings, it rejected the H_0 stating that the two means are not equal.

12.33: Page 1172

(a)

Groups	Sample Size	Mean	Std. Deviation
Control	35	-0.4585	5.2276
Individual	35	-1.6857	4.1265
Group	34	-4.9024	5.0632

(b)

Source	df	SS	MS	F statistic	p-value
Group	2	362.1000	181.0500	7.7678	0.0007278958
Error	101	2354.0851	23.3077		
Total	103	2716.1851			

Looking at the chart above, dividing the mean and standard deviation by 2.2 does not affect the normality. This means that the test statistic, degree of freedom, and p-value remain the same as the previous exercise.

12.41: Page 1176

μ_1 = Blue Eyes, μ_2 = Brown Eyes, μ_3 = Down Eyes, μ_4 = Green Eyes

(a)

Compare the mean of brown eyes to the mean of another color eye:
$\psi_1 = \mu_2 - \frac{(\mu_1+\mu_4)}{2}$

(b)

Compare down eyes to the rest of the eyes:
$\psi_2 = \frac{(\mu_1+\mu_2+\mu_4)}{3} - \mu_3$

12.42: Page 1176

(a)

$\Psi_1, H_0 : \Psi_1 = 0$

$\Psi_1, H_a : \Psi_1 \neq 0$

$\Psi_2, H_0 : \Psi_2 = 0$

$\Psi_2, H_a : \Psi_2 \neq 0$

(b)

$c_1 = 3.72 - \frac{7.05}{2} = 0.195$
$c_2 = \frac{3.19+3.72+3.86}{3} - 3.11 = 0.48$

(c)

$$S_p = \sqrt{\frac{(67-1)(1.65)(2)+...}{(67-1)+...}} = 1.68$$
$$SE_{c_1} = 1.68 * \sqrt{\frac{1}{37} + \frac{\frac{-1}{4}}{67} + \frac{\frac{-1}{4}}{77}} = 0.3098$$
$$SE_{c_2} = 1.68 * \sqrt{\frac{\frac{1}{9}}{67} + \frac{\frac{1}{9}}{37} + \frac{\frac{1}{9}}{77} + \frac{1}{41}} = 0.2933$$

(d)

$$t_1 = \frac{c_1}{SE_{c_1}} = \frac{0.195}{0.3098} = 0.631$$
$$df = n - k = 218$$
$$P(|T| > |t|) = 2[1 - pt(|t|, n-k)] < \alpha$$
$$p - value = 0.5228446 > 0.05 = \alpha$$

Because this p-value is not less than the significance level, H_0 is not rejected.

$$
\begin{aligned}
t_2 &= \frac{0.48}{0.2933} = 1.64 \\
df &= 218 \\
P(|T| > |t|) &= 2[1 - pt(|t|, n-k)] < \alpha \\
p - value &= 0.1024473 > 0.5 = \alpha
\end{aligned}
$$

Because this p-value is not less than the significance level, H_0 is not rejected.

(e)

c_1: $0.195 \pm 1.96 * 0.309 = 0.195 \pm 0.6564 = (-0.41064, 0.80064)$

c_2: $0.48 \pm 1.96 * 0.293 = 0.48 \pm 0.57428 = (-0.09428, 1.05428)$