Math 343 - Lab 5

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Question 1

a)

To estimate value of $(\tau\beta)_{22}$, first must observe that $\bar{y}_{22\cdot} = \frac{100+85.9}{2} = 92.95$. $\bar{y}_{2\cdot\cdot} = 85.9$. $\bar{y}_{\cdot 2\cdot} = 100$. $\bar{y}_{\cdots} = \frac{100+79.2+85.9+83.9}{4} = 87.25$.

Therfore: $\hat{(\tau\beta)}_{22} = 92.95 - 85.9 - 100 + 87.25 = -5.7$

b)

First we note the following:
$\hat{\mu}_{11} = 83.9$
$\hat{\mu}_{12} = 85.9$
$\hat{\mu}_{22} = 100$
$\hat{\mu}_{21} = 79.2$
The main effect of source of protien (A) is:
$\frac{79.2+100}{2} - \frac{83.9+85.9}{2} = 4.7$

The main effect of amount of protien (B) is:
$\frac{85.9+100}{2} - \frac{83.9+100}{2} = 1$

The interaction effect of the two sources is:
$\frac{100+83.9}{2} - \frac{79.2+85.9}{2} = 9.4$

c)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Source	1	220.9	220.9	0.99	0.327
Amount	1	1299.6	1299.6	5.81	0.021
Source*Amount	1	883.6	883.6	3.95	0.054
Error	36	8049.4	223.6		
Total	39	10453.5			

Figure 1: The ANOVA table from Minitab.

$\alpha = 0.10$, for each following test.
Test of Significance of Main Effects of Factor A: H_0: $\tau_1 = \tau_2 = 0$
H_a: At least one τ_i is different.

Since the p-value $= 0.327 > \alpha$, we can conlcude the following. There is not enough statistical evidence to support the hypothesis that at least one τ_i is different.
Test of Significance of Main Effects of Factor B: H_0: $\beta_1 = \beta_2 = 0$
H_a: At least one β_i is different.

Since the p-value $= 0.021 < \alpha$, we can conlcude the following. There is enough statistical evidence to support the hypothesis that at least one β_i is different.
Test of Significance of Main Effects of Factor B: H_0: $(\tau\beta)_{11} = (\tau\beta)_{12} = (\tau\beta)_{22} = (\tau\beta)_{21} = 0$
H_a: At least one $\tau\beta)_{ij}$ is different.

Since the p-value $= 0.054 < \alpha$, we can conlcude the following. There is enough statistical evidence to support the hypothesis that at least one $\tau\beta)_{ij}$ is different.

d)

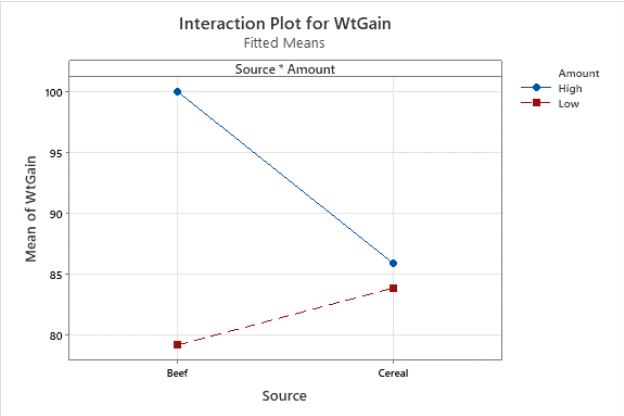


Figure 2: Interaction plot from Minitab.

i.

Yes. Since the lines are not relatively parallel there appears to be interaction.

ii.

Effect of source of protein from graph ~ 4.5. This does support my previous answer.

iii.

Effect of source of protein at the "low" level ~ 4.7. This does support my previous answer.

iv.

I would choose source: beef, and Level: high to increase the weight gain in rats.

e)

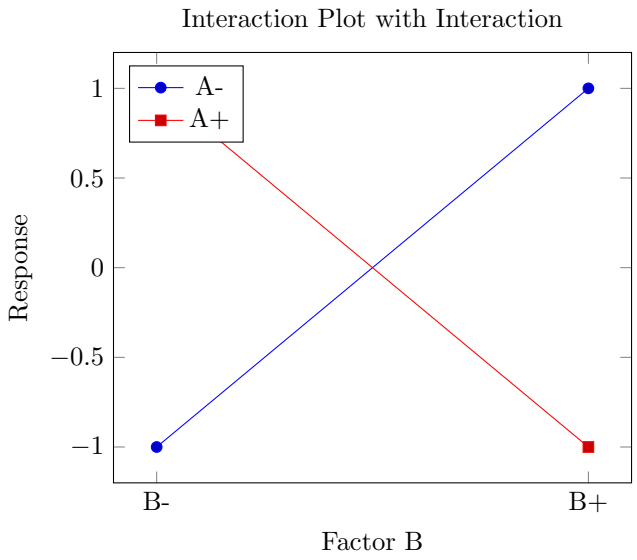
The confidence interval formula is: $\bar{y}_{i\cdot\cdot} - \bar{y}_{i'\cdot\cdot} \pm q_{\alpha,a,df_{error}} \sqrt{\frac{MSE}{b \cdot n}}$

The 95% C.I. for the mean weight gain corresponding to high protien diet is: $\bar{y}_{2\cdot\cdot} - \bar{y}_{1\cdot\cdot} \pm q_{.05,2,1} \sqrt{\frac{MSE}{2 \cdot 10}}$

$100 - 85.9 \pm 3.67 \sqrt{\frac{223.6}{20}}$ 14.1 ± 12.27

Question 2

a)



b)