Qiu Tian

1. $SSE = \sum_i \sum_j (y_{ij} - \bar{y}_{i.})^2$

$= \sum_i \sum_j (y_{ij} - \bar{y}_{..} - (\bar{y}_{i.} - \bar{y}_{..}))^2$

$= \sum_i \sum_j \{(y_{ij} - \bar{y}_{..})^2 + (\bar{y}_{i.} - \bar{y}_{..})^2 - 2(y_{ij} - \bar{y}_{..})(\bar{y}_{i.} - \bar{y}_{..})\}$

$= \sum_i \sum_j (y_{ij} - \bar{y}_{..})^2 + \sum_i \sum_j (\bar{y}_{i.} - \bar{y}_{..})^2 - 2\sum_i \sum_j (\bar{y}_{i.} - \bar{y}_{..})^2$

$= \sum_i \sum_j (y_{ij} - \bar{y}_{..})^2 - \sum_i \sum_j (\bar{y}_{i.} - \bar{y}_{..})^2$

$= SST - SSA \quad \Rightarrow \quad SST = SSA + SSE$

2. a) $\bar{X}_{1.} \quad \bar{X}_{2.} \quad \bar{X}_{3.}$ b) $\bar{X}_{1.} \quad \bar{X}_{2} \quad \bar{X}_{3.} \quad \bar{X}_{4.}$

3. a) Significant difference: $\mu_1 \& \mu_2$, $\mu_1 \& \mu_3$, $\mu_2 \& \mu_3$, $\mu_1 \& \mu_4$, $\mu_3 \& \mu_4$

b) Significant difference: $\mu_1 \& \mu_2$, $\mu_1 \& \mu_5$, $\mu_2 \& \mu_3$, $\mu_2 \& \mu_4$, $\mu_2 \& \mu_5$, $\mu_3 \& \mu_4$, $\mu_3 \& \mu_5$, $\mu_4 \& \mu_5$

4. a) $\frac{5.52^2}{4.47^2} = 1.525$ It is valid.

b)

	SS	DF	MS	F
Factor	611.4	3	203.8	8.89956
Error	916	40	22.9	
Total	1527.4	43		

$DF_T = n-1 = 44-1 = 43$ $DF_A = 4-1 = 3$ $DF_E = 43-3 = 40$

$SSA = 203.8 \times 3 = 611.4$ $SSE = 22.9 \times 40 = 916$ $SST = SSA + SSE$

$F = \frac{MSA}{MSE} = \frac{203.8}{22.9} = 8.89956$

(c) $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$ $\quad H_a: \mu_i \neq \mu_j$ for some $i \neq j$

TS: $F = 8.89956$

$F_{0.05,3,40} = 2.61$ $\quad 8.89956 > 2.61$

F is significant and we have at least one μ different.

(d). $c = \binom{4}{2} = 6$

$t_{0.05/2(6),40} = 2.704$ $\quad MSE = 22.9$ $\quad n_i = 11$

$t \times \sqrt{MSE + (\frac{1}{11} + \frac{1}{11})} = 5.5175$

95% CI for $(\mu_1 - \mu_2) = (\bar{x}_1 - \bar{x}_2 - 5.5175,\ \bar{x}_1 - \bar{x}_2 + 5.5175)$

$= (-2.0675,\ 8.9675)$

for $(\mu_1 - \mu_3) = (-11.4375,\ -0.4025) \Rightarrow$ different

$(\mu_1 - \mu_4)$: $(-3.2675,\ 7.7675)$

$(\mu_2 - \mu_3)$: $(-14.8875,\ -3.8525) \Rightarrow$ different

$(\mu_2 - \mu_4)$: $(-6.7175,\ 4.3175)$

$(\mu_3 - \mu_4)$: $(2.6525,\ 13.6875) \Rightarrow$ different

(e) $\bar{x}_{1.}$ $\quad \bar{x}_{2.}$ $\quad \bar{x}_{3.}$ $\quad \bar{x}_{4.}$

(f) Clover, Eagle or Carnation but NOT Dean.

Because the first three has similar amount of low fat.