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3.7(a) $\bar{y} = \frac{1}{16} \sum_{i=1}^{4} \sum_{j=1}^{4} y_{ij} = 2932$

$MST = \frac{+2 \sum_{i=1}^{4}(\bar{y}_{i\cdot} - 2932)^2}{4-1} = 163247$

$MSE = \frac{\sum_{i=1}^{4}\sum_{j=1}^{4}(y_{ij}-2932) = +2\sum_{i=1}^{4}(\bar{y}_{i\cdot}-2932\ m)^2}{14} = 12826$

$F = \frac{163247}{12826} = 12.7 \quad P < 0.05$

Ho : There's no difference   Hd: there is a difference

Reject Ho in favor of H_1

3.10 (a) Ho: $\mu_{15} = \mu_{20} = \mu_{25} = \mu_{30} = \mu_{35}$

$SS_{Total} = (525 + 1225 + 1586 + 2316 + 616) - \frac{(89 + 77 + 88 + 108 + 84)^2}{25}$

$= 636.96$

$SS_{trug} = (\frac{69^2}{5} + \frac{69^2}{5} + \frac{89^2}{5} + \frac{19^2}{5} + \frac{89^2}{5}) - 3655.04 = 475.76$

$SS_{within} = 636.96 - 475.76 = 161.2$

$F = \frac{475.76/4}{161.2/20} = 14.76 > Fcrit \ 2.866$

Reject Ho in favor of H_1

There is a difference

2.12(a) Ho : $\mu_1 = \mu_2 = \mu_3$ H_1 not all μ are equal

$SSR = [\ ] = 452.67$

$SST = 736.92$

$SSE = 736.92 - 456.67 = 280.0$

$F = \frac{452.67/2}{28625/9} = 7.035$

$F = 7.035 > Fcrit \ 4.26$

So we reject Ho in favor of H_1

3.15(a) $H_0 : \mu_1 = \mu_2 = \mu_3$ H_1 Not all μ are equal

$SSB = 1362708.45$ $F = \dfrac{1362708.33/2}{152025/21} = 9.409577$

$SSW = 152025$

$F_{crit} = 3.468$

$F > F_{crit}$

Reject H_0, in favor of H_1, there's a difference

3.20(a) $H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$ H_1 at least one mean is different

$SSB = 22800$ $F = \dfrac{22800/3}{3266.67/8} = 1.6764$

$SSW = 3266.67$

$F_{crit} = 4.0618 > F$

Fail to reject H_0, there's no sufficient evidence to prove that there's a difference

(b) P-value $= 0.2454$