

HW #12 (Key)

- #1. (a) $H_0 : \mu_1 = \mu_2 = \mu_3$ (i.e., Three group means are the same)
 vs. $H_1 : \text{not } H_0$ (At least one group mean is significantly different.)
 (b) Data are independent random samples from normal populations. Three populations have the same variance.

(c) Test Statistic:

$$\bar{\bar{x}} = 40$$

$$SSB = \sum_{i=1}^k n_i (\bar{x}_i - \bar{\bar{x}})^2 = 4(43 - 40)^2 + 3(44 - 40)^2 + 4(34 - 40)^2 = 228$$

$$SSW = \sum_{i=1}^k \sum_{j=1}^{n_i} (x_{ij} - \bar{x}_i)^2 = + \left\{ (48 - 43)^2 + (39 - 43)^2 + (42 - 43)^2 + (43 - 43)^2 \right\} \\ + \left\{ (40 - 44)^2 + (48 - 44)^2 + (44 - 44)^2 \right\} \\ + \left\{ (39 - 34)^2 + (30 - 34)^2 + (32 - 34)^2 + (35 - 34)^2 \right\} = 120$$

$$SST = SSB + SSW = 348$$

ANOVA TABLE

Source	SS	df	MS	F
Between	SSB = 228	$df_B = k - 1 = 2$	$SSB / df_B = 114$	$MSB / MSW = 7.6$
Within	SSW = 120	$df_W = \sum (n_i - 1) = 8$	$SSW / df_W = 15$	
Total	SST = 348	$df_{total} = n - 1 = 10$		

p-value: less than 0.05

conclusion: We reject H_0 since p -value is less than 0.05. We conclude that at least one group mean is significantly different from the others.

- #2. (a), (b) 4, (c) 16

Source	SS	df	MS	F	p-value
Between	135	3	45	1.59	Greater than 0.05
Within	337	12	28.08		
Total	472	15			

- #3. (a) $H_0 : \mu_1 = \mu_2 = \mu_3$ (i.e., Three group means are the same)
 vs. $H_1 : \text{not } H_0$ (At least one group mean is significantly different.)
 (b) 3 groups
 (c) We do not reject H_0 since p -value is much greater than 0.05. Three group means are not significantly different.

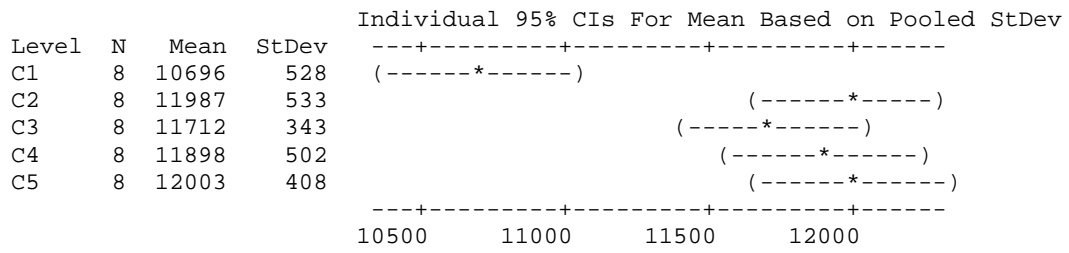
Computer Exercise

- (a) $H_0 : \mu_{Mon} = \mu_{Tue} = \mu_{Wed} = \mu_{Thur} = \mu_{Fri}$ (i.e., Means for five days are the same)
 vs. $H_1 : \text{not } H_0$ (At least one day mean is significantly different.)
 (b) Data are independent random samples from normal populations. Five populations have the same variance.
 (c) We reject H_0 since p -value is much less than 0.05. At least one day of the week shows significantly different mean number of live births.

MTB > aovo c1-c5

Source	DF	SS	MS	F	p-value
Factor	4	9701283	2425321	11.03	0.000
Error	35	7692531	219787		
Total	39	17393814			

S = 468.8 R-Sq = 55.77% R-Sq(adj) = 50.72%



Pooled StDev = 469