Assignment_19.2

Sample means ($\bar{x}$) for the groups :- 48.2, 35.4, 69.8

Intermediate steps in calculating group variances

Group. I

	value	mean	deviations	sq. deviations
1	51	48.2	2.8	7.84
2	45	48.2	-3.2	10.24
3	33	48.2	-15.2	231.04
4	45	48.2	-3.2	10.24
5	67	48.2	18.8	353.44.

Group-II

	Value	Mean	Deviations	Sq. of deviation
1	23	35.4	-12.4	153.76
2	43	35.4	7.6	57.76
3	23	35.4	-12.4	153.76
4	43	35.4	7.6	57.76
5	45	35.4	9.6	92.16

Group III

	Value	Mean	Deviations	Sq. of deviation
1	56	69.8	-13.8	190.44
2	76	69.8	6.2	38.44
3	74	69.8	4.2	17.64
4	87	69.8	17.2	295.84
5	56	69.8	-13.8	190.44

→ Sum of squared deviations from the mean (SS) for the groups:-

Group. I - 612.8, Group 2 = 515.2, Group. 3 = 732.8

$$Var_1 = \frac{612.8}{(5-1)} = 153.2.$$

$$Var_2 = \frac{515.2}{(5-1)} = 128.8.$$

$$Var_3 = \frac{732.8}{(5-1)} = 183.2.$$

$$MS_{error} = \frac{153.2 + 128.8 + 183.2}{3} = 155.07.$$

→ Calculating the remaining error terms for the ANOVA table:

$df_{error} = 15 - 3 = 12$

$SS_{error} = (155.07) * (15-3) = 1860.8.$

Intermediate steps in calculating the variance of the sample means:

Grand mean ($\bar{x}_{grand}$) $= \frac{48.2 + 35.4 + 69.8}{3} = 51.13$

Group mean	Grand mean	Deviations	Sq. Deviations
48.2	51.13	-2.93	8.58
35.4	51.13	-15.73	247.43
69.8	51.13	18.67	348.57.

Sum of squares (SS_{mean}) = 604.58.

Var.(mean) = $\frac{604.58}{(3-1)}$ = 302.29.

$MS_{between}$ = (302.29)(5) = 1511.45

df_{groups} = 3-1 = 2

SS_{groups} = (1511.45) × (3-1) = 3022.9.

→ Test statistic and Critical value.

$F = \frac{1511.45}{155.07} = 9.75.$

$F_{critical}(2, 12) = 3.89.$

Decision: reject H0

Anova (ANOVA) table.

Source	SS	df	MS	F
group	3022.9	2	1511.45	9.75
error	1860.8	12	155.07	
total	4883.7.			

Effect size

$\eta^2 = \frac{3022.9}{4883.7} = 0.62.$

APA write up.

$F(2, 12) = 9.75,\ p < 0.05\ \eta^2 = 0.62.$