

Assignment 5.2

Q Using the following data, perform a oneway analysis of variance using $\alpha = 0.5$. Write up the result in APA format.

Group 1: 51, 45, 33, 45, 67

Group 2: 23, 43, 23, 43, 45

Group 3: 56, 76, 74, 87, 56

	Mean	\bar{x}_j	\bar{x} (whole mean across all groups) $= \frac{48.2 + 35.4 + 69.8}{3} = 51.13$
Group 1	48.2	48.2	
Group 2	35.4	35.4	
Group 3	69.8	69.8	

$$\therefore SSTR = \sum n_j (\bar{x}_j - \bar{x})^2$$

↳ no of observations in each group

$$\Rightarrow SSTR = 5(8.58)^2 + 5(24.74)^2 + 5(34.57)^2$$
$$= 42.92 + 1237.16 + 1742.84$$
$$= 3022.93$$

$$\text{Mean Square total error (MSTR)} = \frac{SSTR}{K-1}$$

$K \rightarrow$ No of groups
 $K-1 \rightarrow$ Degree of freedom

$$MSTR = \frac{3022.93}{3-1} = 1511.46675$$

$$\text{sum of squared error (SSE)} = \sum \sum (x_{ij} - \bar{x}_j)^2$$

$$= (51-48.2)^2 + (45-48.2)^2 + (33-48.2)^2 + (45-48.2)^2 + (67-48.2)^2$$
$$+ (23-35.4)^2 + (43-35.4)^2 + (23-35.4)^2 + (43-35.4)^2 + (45-35.4)^2$$
$$+ (56-69.8)^2 + (76-69.8)^2 + (74-69.8)^2 + (87-69.8)^2 + (56-69.8)^2$$
$$= 1860.8$$

$$MSE = \frac{1860.8}{15-3} = \frac{1860.8}{12} = 155.06$$

$$F_{\text{score}} = \frac{MSTR}{MSE} = \frac{1511.47}{155.06} = 9.75$$

Now from f-table for $\alpha = 0.5$ (as given in Question) & $K=3$, $K_2=12$,
 $F_{CV} = F_{\text{critical value}} = 3.8853$

$$F_{\text{score}} > F_{CV}$$
$$(9.75) > (3.8853)$$

\therefore We reject the null hypothesis and hence all means are not equal.