

Assignment 19.3

Calculate F Test for given 10, 20, 30, 40, 50
and 5, 10, 15, 20, 25

Solution:- let the mean of population of two groups be μ_1 and μ_2

Null Hypothesis:- $H_0: \mu_1 = \mu_2$

Alternate Hypothesis $H_A: \mu_1 \neq \mu_2$

Let us calculate mean and within group variance as follows

x_1	x_2	$x_1 - \bar{x}_1$	$(x_1 - \bar{x}_1)^2$	$x_2 - \bar{x}_2$	$(x_2 - \bar{x}_2)^2$
10	5	-20	400	-10	100
20	10	-10	100	-5	25
30	15	0	0	0	0
40	20	10	100	5	25
50	25	20	400	10	100
$\sum x_1$ = 150 $\bar{x}_1 = \frac{150}{5}$ = 30	$\sum x_2$ = 75 $\bar{x}_2 = \frac{75}{5}$ = 15		$\sum (x_1 - \bar{x}_1)^2$ = 1000		$\sum (x_2 - \bar{x}_2)^2$ = 250

Combined mean of all the groups

$$= \bar{x} = \frac{\bar{x}_1 + \bar{x}_2}{2}$$

$$= \frac{30 + 15}{2} = 22.5$$

$$SS_{\text{within}} = \sum (x_1 - \bar{x}_1)^2 + \sum (x_2 - \bar{x}_2)^2$$

$$= 1000 + 250$$

$$= 1250$$

$$SS_{\text{between}} = n_1 (\bar{x}_1 - \bar{\bar{x}})^2 + n_2 (\bar{x}_2 - \bar{\bar{x}})^2$$

$$= 5 \times (30 - 22.5)^2 + 5 \times (15 - 22.5)^2$$

$$= 5 \times (7.5)^2 + 5 \times (-7.5)^2$$

$$= 562.5$$

$$df_{\text{within}} = N - k = 10 - 2 = 8$$

$$df_{\text{between}} = k - 1 = 2 - 1 = 1$$

$$MS_{\text{within}} = \frac{SS_{\text{within}}}{df_{\text{within}}} = \frac{1250}{8} = 156.25$$

$$MS_{\text{between}} = \frac{SS_{\text{between}}}{df_{\text{between}}} = \frac{562.5}{1} = 562.5$$

$$F = \frac{MS_{\text{between}}}{MS_{\text{within}}} = \frac{562.5}{156.25} = 3.6$$

From F table, with (1, 8) degrees of freedom and $\alpha = 0.05$, we get

$$F_{\text{critical}} = 5.32$$

As F value < F critical

We accept the Null Hypothesis

Hence ~~two~~ for two groups of results, means are not significantly different

In APA notation:

A one way ANOVA was conducted between two groups of results. An analysis of variance showed the ~~two groups~~ mean of two groups of results are not significantly different. $F(1, 8) = 3.6$, $p = 0.05$

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
BETWEEN GROUPS → Between groups	562.5	1	562.5	3.6	0.05
WITHIN GROUPS → Within groups	1250	8	156.25		
Total	1812.5	9			