2. Three varieties A, B, C of a crop are tested in a randomized block design with 4 replications. The plot yields in pounds are as follows:

A	6	C	5	A	8	B	9
C	8	A	4	B	6	C	9
B	7	B	6	C	10	A	6

Analyze the experimental yield and state your conclusion.

Varieties	Yields			
A	6	4	8	6
B	7	6	6	9
C	8	5	10	9

	x_1	x_2	x_3	x_4	T	x_1^2	x_2^2	x_3^2	x_4^2
y_1	6	4	8	6	24	36	16	64	36
y_2	7	6	6	9	28	49	36	36	81
y_3	8	5	10	9	32	64	25	100	81
Total	21	15	24	24	84	149	77	200	198

Step 1:

Null hypothesis H_0: There is no significant difference between yields and varieties.

Alternative hypothesis: H_1: There is a significant difference between yields and varieties.

Step 2:

$N = 12$

$T = 21+15+24+24 = 84$

$$C.F = \frac{T^2}{N} = \frac{(84)^2}{12} = 588$$

Step 3: $SST = \Sigma x_1^2 + \Sigma x_2^2 + \Sigma x_3^2 + \Sigma x_4^2 - C.F$

$= 149 + 77 + 200 + 198 - 588$

$= 36.$

$$SSC = \frac{(\Sigma x_1)^2}{c_1} + \frac{(\Sigma x_2)^2}{c_2} + \frac{(\Sigma x_3)^2}{c_3} + \frac{(\Sigma x_4)^2}{c_4} - C.F$$

$$= \frac{(21)^2}{3} + \frac{(15)^2}{3} + \frac{(24)^2}{3} + \frac{(24)^2}{3} - 588$$

$= 18$

$$SSR = \frac{(\Sigma y_1)^2}{r_1} + \frac{(\Sigma y_2)^2}{r_2} + \frac{(\Sigma y_3)^2}{r_3} - C.F$$

$$= \frac{(24)^2}{4} + \frac{(28)^2}{4} + \frac{(32)^2}{4} - 588$$

$= 8$

$SSE = SST - SSC - SSR$

$= 36 - 18 - 8$

$= 10$

Step 4: ANOVA Table:

Source of Variation	Degrees of freedom	sum of squares	Mean sum of squares	variance ratio	Table value
Between columns	$C-1=4-1$ $=3$	SSC $=18$	$MSC=\frac{SSC}{C-1}$ $=6$	$F_C=\frac{MSC}{MSE}$ $=3.75$	$F_\alpha(C-1,(C-1)(r-1))$ $F_\alpha(3,6)$ $=4.76$
Between rows	$r-1=3-1$ $=2$	SSR $=8$	$MSR=\frac{SSR}{r-1}$ $=4$	$F_R=\frac{MSR}{MSE}$ $=\frac{4}{1.6}=$ $=2.5$	$F_\alpha(r-1,(C-1)(r-1))$ $F_\alpha(2,6)$ $=5.14$
Between errors	$(C-1)(r-1)$ $3\times2=6$	$SSE=10$	$MSE=\frac{SSE}{(C-1)(r-1)}$ $=1.6$		

Step 5: Decision:

$F_C=3.75<4.76=F_\alpha$, H_0 is accepted

$F_C=2.5<5.14=F_\alpha$, H_0 is accepted

∴ There is no significant diffrence between yields and varieties.