F-test (Variance ratio test)

* The following data is about the number of bulbs produced daily by two workers A and B.

A	B
40	39
30	38
38	41
41	33
38	32
35	39
	40
	34

$\alpha = 0.05$.

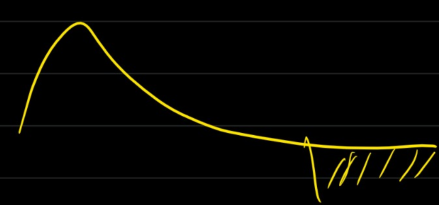
Can we consider based on the data worker B is more stable & effecient ?

* why not mean here can be used to test ?

→ Mean is same for both the sample. So we will compare variances.

① $H_0 : S_1^2 = S_2^2$, $H_A : S_1^2 \neq S_2^2$

② F test , one tail test , $\alpha = 0.05$



③ $F_{statistics} = \frac{S_1^2}{S_2^2}$

Worker A.

X_1	$\bar{X}$	$(X_i - \bar{X}_1)^2$
40	37	9
30	37	49
38	37	1
41	37	16
38	37	1
35	37	4

$\bar{X} = 37$ $\quad \Sigma (X_i - \bar{X}_1)^2 = 80$

Worker B.

X_2	$\bar{X}_2$	$(X_2 - \bar{X}_2)^2$
39	37	4
38	37	1
41	37	16
33	37	16
32	37	25
39	37	4
40	37	9
34	37	9

$\bar{X}_2 = 37$ $\quad \Sigma (X_2 - \bar{X}_2) = 84$

$$S_1^2 = \frac{80}{n-1} = \frac{80}{6-1} = \frac{80}{5} = 16$$

$$S_2^2 = \frac{84}{8-1} = \frac{84}{7} = 12$$

$$F_{statistics} = \frac{16}{12} = 1.33$$

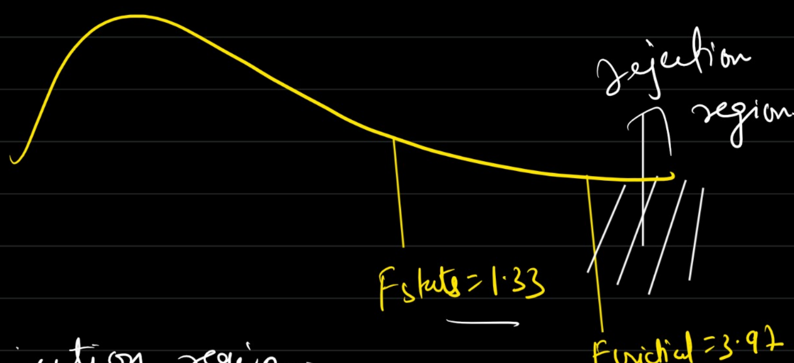
<u>Step-4</u>

$F_{critical}$ $\alpha = 0.05$, $dof_1 = 5$ $dof_2 = 7$

dof_1 → in Numerator of F_{stats}. dof_2 → Denominator of f table

$F_{critical}$ $_{\alpha = 0.05}$ $dof\ (5, 7) = 3.97$

⑤ Fcritical is greater than Fstats



$1.33 < 3.97$

So its not in rejection region

We fail to reject the H_0 (Null hypothesis)

→ Worker B is not more stable | effective as compared to A.