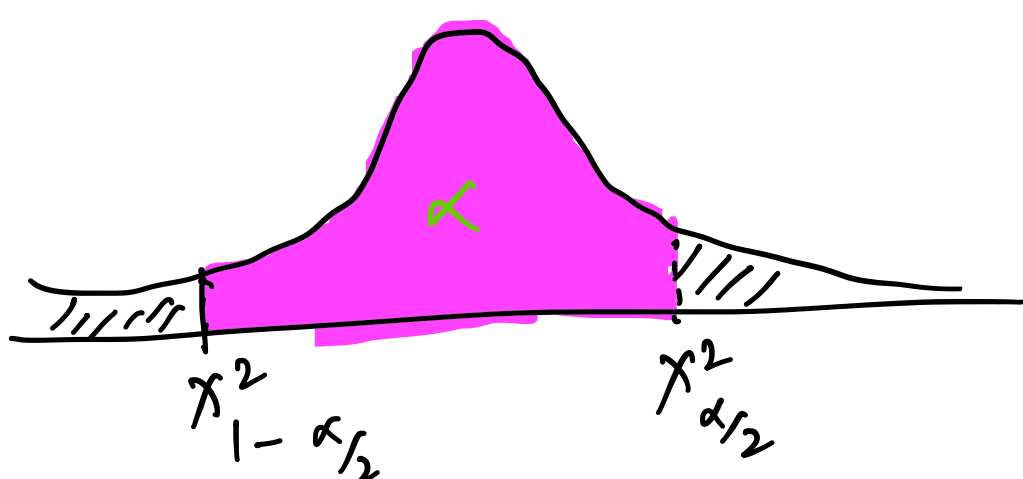We know that

$$\frac{(n-1)S^2}{\sigma^2} \text{ is } \text{ a chi square distribution.}$$
with $(n-1)$ dof.

• Now here we have to note, one thing

Since χ^2 is not symmetric, so we do not

use $\chi^2_{\alpha/2}$ & $-\chi^2_{\alpha/2}$. Instead we

use $\chi^2_{\frac{\alpha}{2}}$ & $\chi^2_{1-\frac{\alpha}{2}}$

$$P\left(\chi^2_{1-\frac{\alpha}{2}} < \frac{(n-1)S^2}{\sigma^2} < \chi^2_{\alpha/2} \right) = 1-\alpha$$

↓ Take reciprocal

$$P\left(\frac{(n-1)S^2}{\chi^2_{\alpha/2}} < \sigma^2 < \frac{(n-1)S^2}{\chi^2_{1-\frac{\alpha}{2}}} \right) = 1-\alpha$$

So the confidence interval is

$$\left(\frac{(n-1)S^2}{\chi^2_{\alpha/2}} \quad , \quad \frac{(n-1)S^2}{\chi^2_{1-\alpha/2}} \right)$$

<u>Que</u> The following are the weights, in

decagrams, of 10 packages of grass

seed distributed by a certain company:-
46.4, 46.1, 45.8, 47.0, 46.1, 45.9
45.8, 46.9, 45.2 and 46.

Find a 95% confidence interval for the

variance of the weights of all such

packages of grass seed distributed by
the company assuming a normal population.

<u>Soln</u> $S^2 = 0.286$ (doing calculations)

95% confidence interval

$$\chi^2_{0.025} = 19.023 \qquad (n-1 = 10-1 \text{ dof}$$
$$= 9)$$

$$\chi^2_{0.975} = 2.700$$

$$\frac{(9)(6.286)}{19.023} < \sigma^2 < \frac{(9)(0.286)}{2.7}$$

$$0.135 < \sigma^2 < 0.953$$