

## Confidence interval for mean when population standard deviation is not known.

Saturday, 2 December 2023

3:32 PM

- Here  $\frac{\bar{X} - \mu}{S/\sqrt{n}}$  is a  $t$  distribution. with  $(n-1)$  dof
- So our  $(1-\alpha)100\%$  interval becomes

$$\left( \mu - t_{\alpha/2} \frac{S}{\sqrt{n}}, \mu + t_{\alpha/2} \frac{S}{\sqrt{n}} \right)$$

- And one sided bounds will be

lower bound  $\mu - t_{\alpha} \frac{S}{\sqrt{n}}$

upper bound  $\mu + t_{\alpha} \frac{S}{\sqrt{n}}$

Que The contents of seven similar containers of Sulphuric acid are 9.8, 10.2, 10.4, 9.8, 10.0, 10.2 and 9.6 litres. Find a 95% confidence interval for the mean contents of all such containers, assuming an approximately normal distribution.

Soln  $\bar{x} = 10.0$  (These calculations are done from the data given).  
 $s = 0.283$

Note that  $\sigma$  is not given.

95% confidence interval

$$1-\alpha = 0.95$$
$$\alpha = 0.05$$

$$t_{0.05} = 2.447$$

(table)

$$\text{dof} = n-1 = 6$$

$$\left( \bar{x} - t_{\alpha/2} \frac{s}{\sqrt{n}}, \bar{x} + t_{\alpha/2} \frac{s}{\sqrt{n}} \right)$$

$$\left( 10 - 2.447 \left( \frac{0.283}{\sqrt{7}} \right), 10 + 2.447 \left( \frac{0.283}{\sqrt{7}} \right) \right)$$

$$(9.74, 10.26)$$