M358K: November 17th, 2021.

Single sample t-procedures.

It is essential that either the sample is large ($n \geq 30$), or if the sample is small that there is evidence of normality.

To check for normality:

- histogram
- box plot
- qq plot

Confidence Intervals for μ.

C ... confidence level

pt estimate $\pm$ margin of error

$t^*(df=n-1) \cdot$ std error

$\frac{s}{\sqrt{n}}$

$$\bar{x} \pm t^*(df=n-1) \cdot \frac{s}{\sqrt{n}}$$

In R: $t^*(df=n-1)$ is $qt\left(\frac{1+C}{2}, df=n-1\right)$.

Example. [Ramachandran · Tsokos]

The scores of a random sample of 16 had a sample mean of $\boxed{540}$ and a sample standard deviation of $\boxed{50}$.
Assume that the scores come from a normal population.
Construct a 95% confidence interval for the population mean μ.

$\rightarrow$: $n=16$; $\bar{x}=540$; $\boxed{s=50}$

$t^*(df=15) = 2.131$ or $qt(0.975, df=15) = 2.13145$

0.025 upper tail   0.975 lower tail

standard error : $\frac{s}{\sqrt{n}} = \frac{50}{\sqrt{16}} = \frac{50}{4} = 12.5$

margin of error $= 2.131\,(12.5) = 26.6375$

$$\Rightarrow \quad \boxed{\mu = 540 \pm 26.6375}$$

or

$$CI = (513.36,\ 566.64)$$

or

$$513.36 < \mu < 566.64$$

$\blacksquare$