

Lesson #15

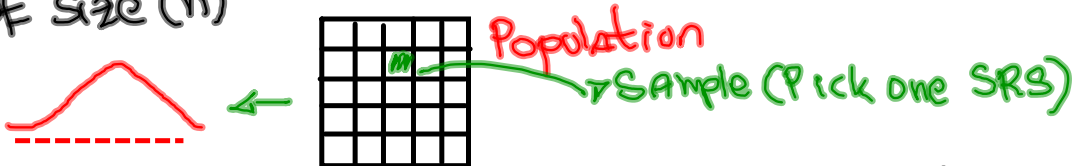
Aim: How do we estimate a population mean (μ) when we know σ ?

Today's objectives:

- point estimates ✓
- confidence interval ✓ ex
- sample size determination ex

I- Point Estimates.

1) A population is divided into equal samples of size (n)



2) What information, would get from the selected sample?
 \bar{x} (mean of the sample)
 s (std. of the sample)

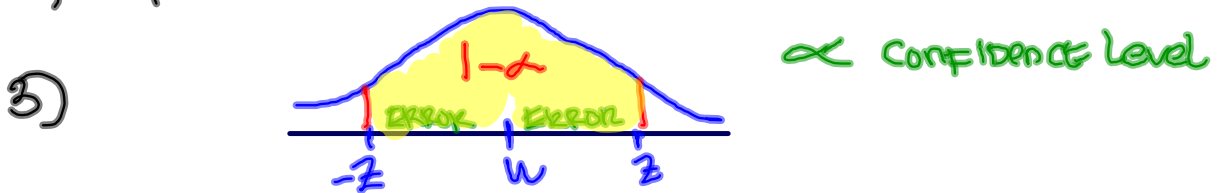
3) \bar{x} and s are our best estimate of μ and σ

4) As " n " gets bigger the approximation gets better.

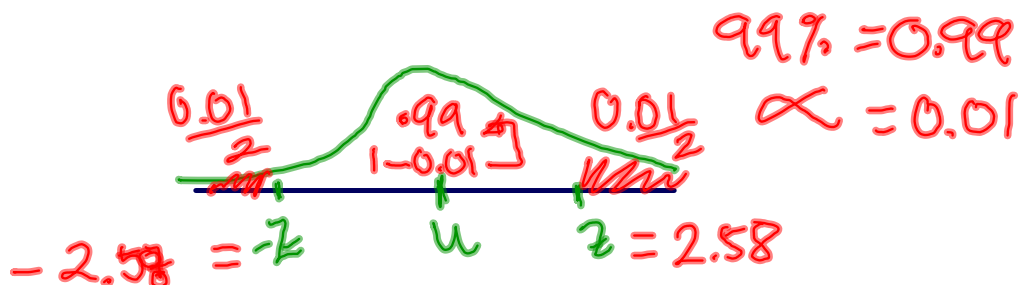
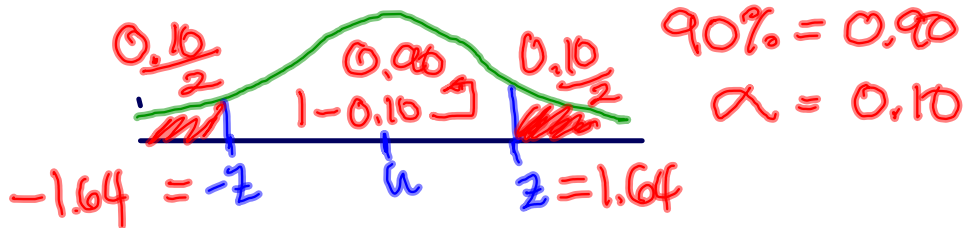
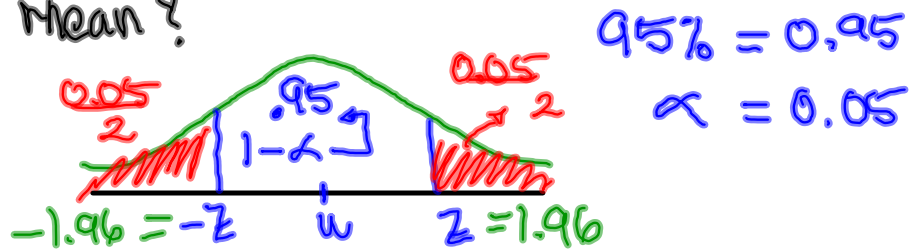
II Confidence Interval

1) SRS will represent the population

$$2) \bar{x} - \text{ERROR} < \mu < \bar{x} + \text{ERROR}$$



4) ex What does a 95% confidence Interval Mean?



5) Confidence Interval - Example.

Body temperatures Avg. 98.6 is acceptable body temp. for adults.

What is the mean body temperature?

(n) Sample size = 106 people.

→ $\sigma = 0.62$ (stand. dev. for the population)

$\bar{x} = 98.2$ (mean of the sample)

estimate μ at 95% confidence interval

$$\bar{x} - E < \mu < \bar{x} + E$$

$$98.2 - 0.118 < \mu < 98.2 + 0.118$$

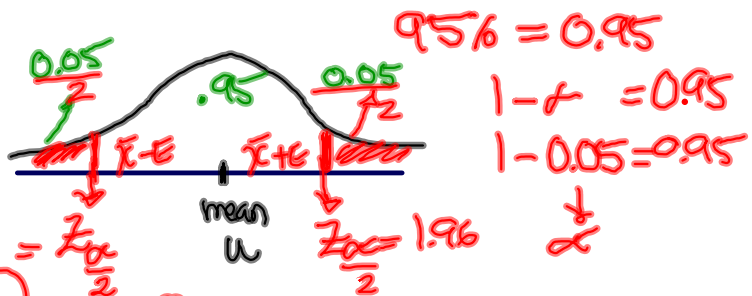
$$98.082 < \mu < 98.318$$

95%

$$E = z_{\frac{\alpha}{2}} \cdot \frac{\sigma}{\sqrt{n}}$$

$$E = 1.96 \cdot \frac{0.62}{\sqrt{106}}$$

$$E = 1.96 \times (0.62 \div \sqrt{106}) = 0.1180$$



Interpretations of the previous solution

① 95% of all samples will contain the mean of the population

② there is a 95% probability that the mean is between $98.082 < \mu < 98.318$

III - Sample Size (n) determination

$$1) E = Z_{\frac{\alpha}{2}} \cdot \frac{\sigma}{\sqrt{n}}$$

$$n = \left(\frac{Z_{\frac{\alpha}{2}} \cdot \sigma}{E} \right)^2$$

2) Solve for n

$$n = \left(\frac{Z_{\frac{\alpha}{2}} \cdot \sigma}{E} \right)^2$$

28. An editor wants to estimate average the number of pages in bestselling novels, so that his estimate falls within 20 pages of the true average. Assuming that the standard deviation is 63 pages, how large a sample of bestselling novels is needed to achieve

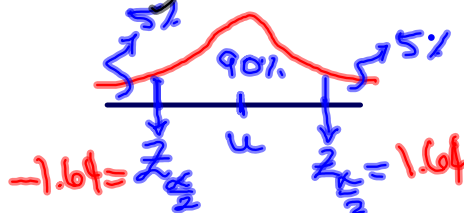
- a. 90% confidence? $-27 \rightarrow 38 \rightarrow 39$
- b. 95% confidence? \rightarrow # OF PAGES
- c. Identify the variable in this context
- d. Identify an individual in this context \rightarrow Novel

$$n = \left(\frac{z_{\frac{\alpha}{2}} \cdot \sigma}{\text{ERROR}} \right)^2$$

a) $n = \left(\frac{1.64 \cdot 63}{20} \right)^2 = 26.69 \approx 27$ Books per year sample.
 $\alpha = 0.10$

At 90%:

$$z_{\frac{\alpha}{2}} = 1.64$$



calculator

Menu, 2, F5, F1, F3

Data: VARIABLE

tail: center

Area: 0.90

$\alpha = 1$

$u = 0$

Execute

