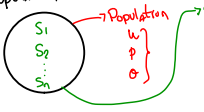
Lesson 17 - Week 9 (1 of 2)

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

I - Point Estimates

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



Note: If the population is not normally Dist then $n > 30$

point estimates as n get bigger the estimates get better

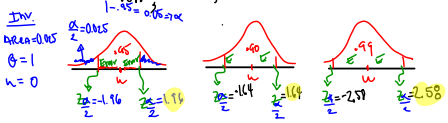
II - Confidence Interval

1) Requirement - Sample must a Random Sigle Sample.

2) $[\bar{x} - E < \mu < \bar{x} + E]$

3) popular Levels of confidence

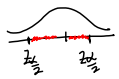
95%, 90%, 99%.



Nov 16-1:52 PM

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

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



Ex) $\mu = 98.6°$ is the acceptable body temp. (ADULTS)

What is the mean body temp.? Use $\sigma = 0.62$

- Let's take SRS
- $n = 106$ people
- two measures their temp. → $\bar{x} = 98.2$, $\hat{p}$, s
- Let's create an interval

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

$E = 1.96 \times \frac{.062}{\sqrt{106}} = 0.1180$

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

$98.2 - 0.1180 < 98.6 < 98.2 + 0.1180$

- estimate the C.I at 95% $[98.082, 98.318]$

Interpretation of my interval

- 95% of all samples will contain the μ
- there is a 95% prob that the mean is between 98.082 and 98.318

Nov 16-2:36 PM

II How do you find n?

n = size of the sample

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

Solve for n:

$$n = \left[\frac{z_{\frac{\alpha}{2}} \cdot \sigma}{E}\right]^2$$

From the Previous Sample

$z_{\frac{\alpha}{2}} = 1.96$

$\sigma = 0.62$

$E = 0.1180$

$$n = \left(\frac{1.96 \times 0.62}{0.1180}\right)^2$$

$n = 106$

Nov 16-2:55 PM

An engineer wishes to determine the width of a particular electronic component. If she knows that the standard deviation is 3.2 mm, how many of these components should she consider to be 80% sure of knowing the mean will be within ± 0.2 mm?

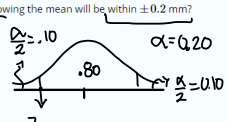
- 182
- 4306
- 32
- 21
- 421

$\sigma = 3.2$ mm

$n = $ ____

L.C = 80%.

$E = \pm 0.2$ mm



$z_{\frac{\alpha}{2}} = 1.28155$ Inv. (Left)

$\sigma = 1$

$\mu = 0$

$$n = \left[\frac{z_{\frac{\alpha}{2}} \cdot \sigma}{E}\right]^2 = \left(\frac{1.28155 \cdot 3.2}{0.2}\right)^2 = 421$$

Nov 16-3:03 PM