Confidence Intervals

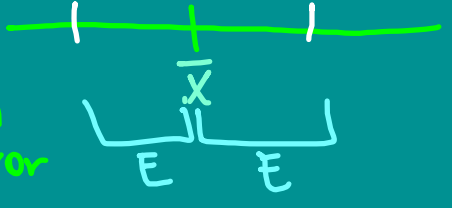
$z = \frac{x - \mu}{\sigma}$ only for population data.

Inferential Statistics – draw conclusions about a population based on a sample.

Confidence Interval – an interval around the sample mean ($\bar{x}$) in which the population mean (μ) lies within a certain level of confidence.

$\bar{x} \pm E$

↑ margin of error



3 Steps to find a confidence interval.

1) Find standard deviation of the sampling distribution. (Standard error of the mean = $\sigma_{\bar{x}}$)

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{s}{\sqrt{n}} \quad \text{if } n \geq 30$$

error in report

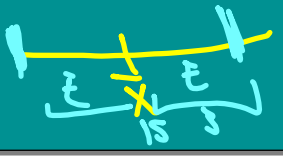
2) Find margin of error (E)

$$E = z \cdot \sigma_{\bar{x}}$$

z is based on % confident

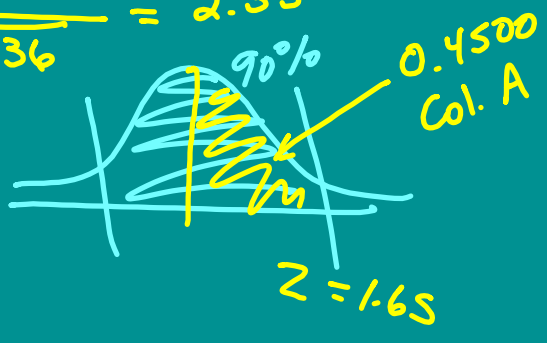
3) Find conf. interval

$$\bar{x} \pm E$$



Mean weight of 36 h.s. wrestlers is 136.4 lb.
Standard dev = 14.1 lb. Find a 90% conf. interval.
for the mean weight of all h.s. wrestlers.

1) $\sigma_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{14.1 \text{ lb}}{\sqrt{36}} = 2.35$



2) $E = z \cdot \sigma_{\bar{x}}$
$= 1.65 * 2.35$
$= 3.88$ lb.

3) $\bar{x} \pm E$
136.4 ± 3.88
$132.52 \text{ lb} - 140.28 \text{ lb}$

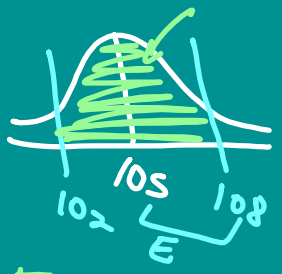
We are 90% confident to mean weight of all h.s. wrestlers falls in this interval.

81 cattle fed a special diet

Mean wt. gain = 105 lb. $s = 20$ lb.

What is the probability a cow gained 102 lb – 108 lb. ?

% confident



$$\sigma_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{20 \text{ lb}}{\sqrt{81}} = \frac{20}{9} = 2.22$$

$$E = z \cdot \sigma_{\bar{x}}$$

$$\bar{x} \pm E$$

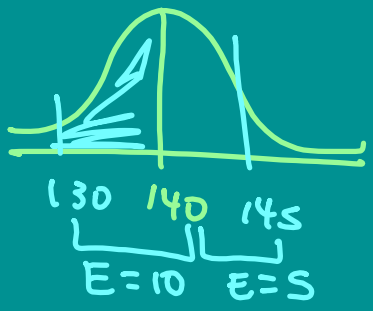
$$E = z \cdot \sigma_{\bar{x}}$$

$$\frac{3}{2.2} = \frac{z \cdot 2.2}{2.2}$$

$$1.35 = z$$

Col $t = 0.4115 * 2 =$ **0.823**

Find prob. 130 — 145 $\bar{x} = 140$



Sample Size

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

$$n = \left(\frac{1.96 \cdot 20}{3} \right)^2$$

Always round up!

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

$$E = z \cdot \sigma_{\bar{x}}$$

$\bar{x} = 105$ lb

$s = 20$ lb

90% conf.