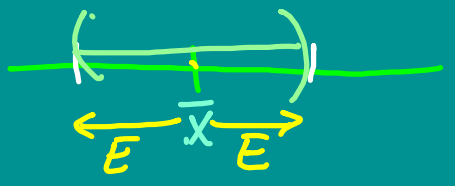
Confidence Intervals

$z = \frac{x - \mu}{\sigma}$

Inferential Statistics – use a sample to describe a population.

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



E = margin of error

3 Steps to find a confidence interval.

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

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

2) Find margin of error (E)

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

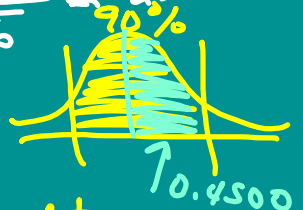
z is based on % confident

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) $\sigma_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{14.1}{\sqrt{36}} \approx 2.350$ ← use 3 decimal places



0.672

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

$E = 1.65 \cdot 2.350$

$E = 3.88$ ← Round to 2 decimals

3) 136.4 ± 3.88

132.52 lb – 140.28 lb.

We are 90% confident that the population mean falls in this interval.

81 cattle fed a special diet

Mean wt. gain = 105 lb. $s = 10$ lb.

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

105 $E = 3$

Find % confident

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

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

$\bar{x} \pm E$

$\sigma_{\bar{x}} = \frac{10}{\sqrt{81}} = 1.111$

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

$\frac{3}{1.111} = \frac{z \cdot 1.111}{1.111}$

$2.70 = z$

z 2.7

0.4965
X2
0.9930

Find prob. 130 — 145

$\bar{x} = 140$

10 140 5

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

$10 = z \cdot 4.3$

$5 = z \cdot \sigma_{\bar{x}}$

$5 = z \cdot 4.3$

Sample Size

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

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

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

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

$$\frac{E}{z} = \frac{\sigma}{\sqrt{n}}$$

$$\frac{E}{z}\sqrt{n} = \sigma$$

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

$$\frac{E^2}{z^2} n = \sigma^2$$

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

Mean GPA $3.1 \overset{3.3}{-} 3.5$ $\overset{0.2}{}$

92% $\sigma = 1.4$

92% Confident

$z = 1.75$

$$n = \left(\frac{1.75 \cdot 1.4}{0.2}\right)^2 = 150.062$$

$\approx$ 151 students