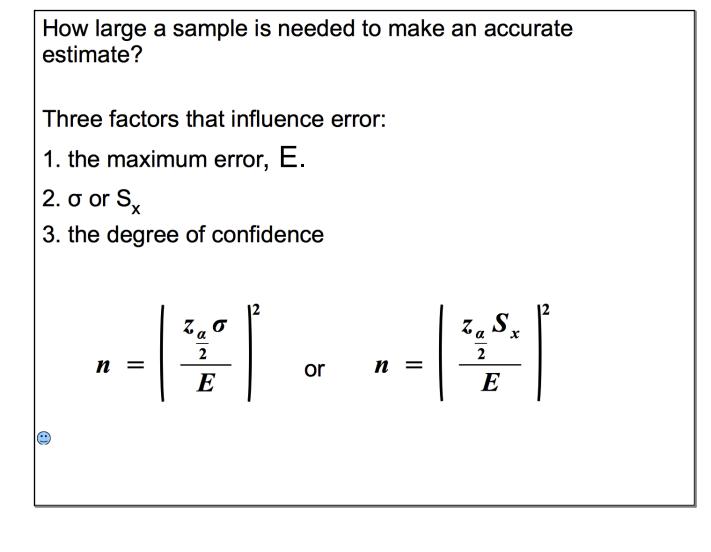# How many do you need?

Confidence Intervals for the mean.

What's the single most important factor that influences accuracy of a sample?

How large a sample is needed to make an accurate estimate?

Three factors that influence error:

1. the maximum error, E.

2. σ or S_x

3. the degree of confidence

$$n = \left| \frac{z_{\frac{\alpha}{2}} \sigma}{E} \right|^2 \quad \text{or} \quad n = \left| \frac{z_{\frac{\alpha}{2}} S_x}{E} \right|^2$$

Confidence	$z_{a/2}$
90%	1.65
95%	1.96
99%	2.56

Remember these pairs!

e.g.1   A researcher is interested in estimating the average salary of police officers in a particular city. She wants to be 95% confident that her estimate is correct. If the standard deviation $1050, how large a sample is needed to get the desired information and to be accurate within $200?

e.g.1   A researcher is interested in estimating the average salary of police officers in a particular city. She wants to be 95% confident that her estimate is correct. If the standard deviation $1050, how large a sample is needed to get the desired information and to be accurate within $200?

E = 200,   σ = 1050,   and 95% means 1.96

n = ((1.96 * 1050) / 200)^2
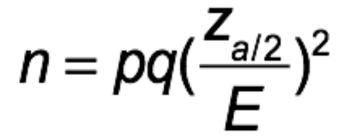
n = 105.88

So the researcher needs a sample size of 106.

e.g. 2

How large a sample would you need to take to find the average age, in years, of Lincoln students with an accuracy within three months and to be 99% confident of your estimate? There are _____ students at Lincoln. Standard deviation was found to be 1.25yrs.

e.g. 3

If the noise level in a math classroom was found to be 69.5 decibels, with s.d. = 2.1. How many samples are needed to ensure with 99% confidence, the maximum error does not exceed 1.5 decibels?

Calculating n when trying to find proportions is the same process as for means, but there is a different formula.

$$n = pq\left(\frac{z_{a/2}}{E}\right)^2$$

How large a sample of Lincoln students would you need, to be 90% confident of your prediction of what proportion of blue eyed students there are?

This is a sampling distribution (n=100) with a p=0.70. If 70% of Lincoln students have brown hair, In a random sample of 40 students how many would you expect to have brown hair?