



Ask Mish

Inferential statistics: how to calculate confidence intervals

General formula for a confidence interval

$$\bar{X} \pm Z \sigma / \sqrt{N}$$

| Confidence | $\alpha/2$ | Z score |
|------------|------------|---------|
| 90% | 0.05 | 1.65 |
| 95% | 0.025 | 1.96 |
| 99% | 0.005 | 2.58 |

The *higher* the confidence level, the *wider* the confidence interval.

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- Use this to calculate a 95% confidence interval for μ .
- To calculate a 95% confidence interval for μ :

$$95\% \text{ CI} = \bar{X} \pm 1.96 \text{ SE}$$

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- CALCULATING CONFIDENCE INTERVAL:

$$c.i. = \bar{x} \pm Z \left(\frac{\sigma}{\sqrt{N}} \right)$$

This part of the equation is called the margin of error. Your book calls this section E.

- N=sample size, you take n outcomes and calculate the X= average. Margin of error includes: standard error (SE) and Z score.

$$\text{Standard error} = \frac{\sigma_x}{\sqrt{N}}$$

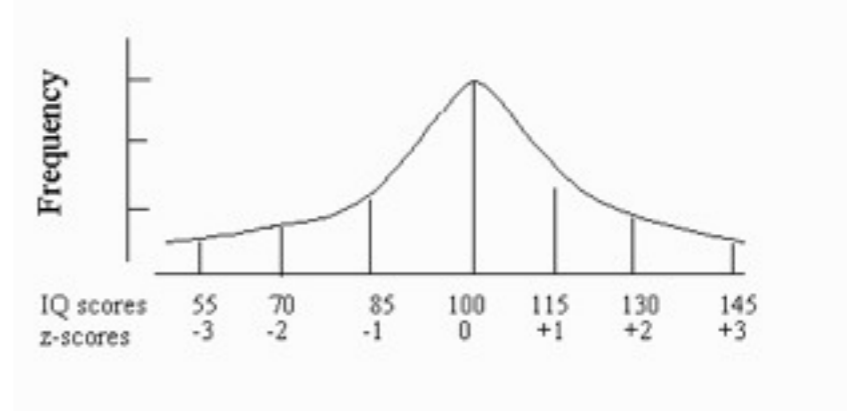
As sample size N goes up you have a better estimation from a larger N. So as N goes up, the error goes down meaning **standard error (SE)** is less error than standard deviation (sigma) in the formula on the left.

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

μ = Mean
 σ = Standard Deviation

Z score or standard score tells you how far from the mean your C.I. goes and to calculate the Z score use the formula on the left where mean=0 and S= 1. Z is actually how many standard deviations far from the mean goes the C.I. you chose.

For practical purpose,
Z=2 for 95% c.i
Z=2.5 for 99% c.i.



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