

Sheet 912: Confidence Interval and Confidence Level

A **confidence interval** provides an interval of plausible values for an athlete's *ABILITY* or an interval of plausible values for the difference in an athlete's *ABILITY* in two different contexts.

The **confidence level** (CL) of a confidence interval describes how much confidence we should have that the interval of plausible values actually contains an athlete's *ABILITY*. For example, if intervals were calculated for many athletes at the 95% confidence level, about 95% of the intervals would successfully contain the *ABILITY* of the athlete for whom the interval was calculated.

Confidence interval for a proportion

p = true proportion (*ABILITY*)

$\hat{p}$ = observed proportion (*PERFORMANCE*)

n = observed sample size (number of attempts)

$$95\% \text{ confidence interval: } \hat{p} \pm 2 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

Note: the multiplier 2 is chosen to get a 95% CL (68%-95%-99.7% rule). The multiplier can be found with a t -distribution and is higher than 2 when n is small. It's 2.01 for $n = 50$. We'll use 2.

Confidence interval for a mean

μ = true mean (*ABILITY*)

σ = true standard deviation (not used in the formula)

$\bar{x}$ = observed mean (*PERFORMANCE*)

s = observed standard deviation (of individual *PERFORMANCES*)

n = number of observations, sample size

$$95\% \text{ confidence interval: } \bar{x} \pm 2 \frac{s}{\sqrt{n}}$$

