Q: How do Logger Pro and Logger Lite calculate linear least-squares fits?

A: The program calculates the "best fit" line on graphs by using linear regression by the method of least squares. The equations used are:

$$\text{slope} = M = \frac{n\,(\sum x_i y_i) - (\sum x_i)\,(\sum y_i)}{\Delta}$$

$$\text{y-intercept} = B = \frac{(\sum x_i^2)\,(\sum y_i) - (\sum x_i)\,(\sum x_i y_i)}{\Delta}$$

$$\text{correlation coefficient} = \frac{\sum (x_i - x_m)\,(y_i - y_m)}{(n-1)\,s_x\,s_y}$$

$$\text{standard deviation of slope} = \text{SQRT}(\, n * \sigma_y^2 / \Delta)$$

$$\text{standard deviation of y-intercept} = \text{SQRT}(\, \sigma_y^2 \sum x_i^2 / \Delta)$$

where: n = number of data pairs

$\Delta = n\,(\sum x_i^2) - (\sum x_i)^2$

s_x = standard deviation of x data

s_y = standard deviation of y data

$$\sigma_y^2 = \left(\frac{1}{n-2}\right) \sum (y_i - B - M\,x_i)^2$$

These are fairly standard formulas.[1] The correlation coefficient of regression is a useful measure of how well the data fits a straight line, but it should not be overused. Always examine the graph. The coefficient is greatly affected by a few extreme points.

If you are using the slope to determine some physical quantity (eg, the acceleration from a graph of velocity vs time) then the standard deviation of the slope is a reasonable 67% confidence level uncertainty.

[1]Refer to a statistics text for more information; for example, *An Introduction to Error Analysis* by John R. Taylor, Oxford University Press, 1982.