

Propagation of Random Error

Type of Calculation	Function	s_y
Multiply by a constant	$y=xa$	$s_y = x s_a$
addition/subtraction	$y=a-b+c$	$s_y = \sqrt{s_a^2 + s_b^2 + s_c^2}$
multiplication/division	$y=a \cdot b/c$	$s_y = y \cdot \sqrt{\left(\frac{s_a}{a}\right)^2 + \left(\frac{s_b}{b}\right)^2 + \left(\frac{s_c}{c}\right)^2}$
base e logarithm	$y=\ln(a)$	$s_y = \frac{s_a}{a}$
base 10 logarithm	$y=\log_{10}(a)$	$s_y = 0.434 \left(\frac{s_a}{a}\right)$
exponentiation	$y=a^x$	$s_y = yx \cdot \left(\frac{s_a}{a}\right)$
base e antilogarithm	$y=\text{antiln}(a)$ or $y=e^a$	$s_y = y \cdot s_a$
base 10 antilogarithm	$y=\text{antilog}_{10}(a)$ or $y=10^a$	$s_y = y \cdot 2.303s_a$

a, b, c are experimental variables whose standard deviations are s_a , s_b , and s_c
x is a constant that has no uncertainty