

Error Propagation

There are two main methods for propagating the errors through calculations. In both cases, the method used for propagation depends on the type of calculation. While only one digit is required for the error factor, two digits are usually carried through the calculations.

There is no need to provide an example calculation for error propagation. **Do** indicate which method you are using! The propagated error can be reported as either an absolute uncertainty or as a percentage.

	Basic Method	Root Mean Square
adding or subtracting	add the absolute uncertainties	add the squares of the absolute uncertainties and then take the square root of the sum
$(A \pm \Delta A) + (B \pm \Delta B)$	$= (A+B) \pm (\Delta A+\Delta B)$	$= (A+B) \pm \sqrt{\Delta A^2 + \Delta B^2}$
$(A \pm \Delta A) - (B \pm \Delta B)$	$= (A-B) \pm (\Delta A+\Delta B)$	$= (A-B) \pm \sqrt{\Delta A^2 + \Delta B^2}$
multiplying or dividing	convert the uncertainties to percents and add the percents	add the squares of the fractional uncertainties and then take the square root of the sum
$(A \pm \Delta A) \times (B \pm \Delta B)$	$= (A \times B) \pm [(\Delta A/A) \times 100\% + (\Delta B/B) \times 100\%]$	$= (A \times B) \pm (A \times B) \sqrt{(\Delta A/A)^2 + (\Delta B/B)^2}$
$(A \pm \Delta A) / (B \pm \Delta B)$	$= (A/B) \pm [(\Delta A/A) \times 100\% + (\Delta B/B) \times 100\%]$	$= (A/B) \pm (A/B) \sqrt{(\Delta A/A)^2 + (\Delta B/B)^2}$