-> Fourier transform
-> laplace transform
-> Fundamental theorem of algebra
-> Riemann hypothesis
-> Green's function

* Zeros are significant when not as placeholders.
* More precise measurement more sigfigs.
* Less precise measurement less sigfigs

Mcquarrie
Chapter III : Experimental Error

* Significant figures -> Minimum # of digits needed to write a number in Scientific notation.
-> writing it without losing precision.

Types of Errors:

1. Systematic Error -> Flaw in experiment equipment or design.
   -> Reproducible
   -> can be corrected
   -> always +ve or -ve to the actual value
   * Miscalibrated sensor

2. Random Error -> Comes from things you can't control
   -> Non reproducible
   -> Example of things we can't control: Temp & Pressure
   -> * Electrical noise * When measuring voltage; the last number keeps on changing.

Accuracy & Precision

Precision -> How reproducible is the result; related to standard deviation

Accuracy -> How close is result close to true value.

Expressing Uncertainty

① Absolute Uncertainty: $97.54\ cm \pm 0.02\ cm$ → btw $97.52 - 97.56$

have units

② Relative Uncertainty: $\dfrac{\text{absolute uncertainty}}{|\text{Value of measurement}|} = \dfrac{0.02\ cm}{97.54\ cm} = 0.0002$

[no units]

③ % relative = Relative Uncertainty × 100

$= 0.0002 \times 100 = 0.02\%$

Propagation of Uncertainty

$$= \frac{0.154\ g \pm \overset{e_1}{0.002}\ g - 0.105\ g \pm \overset{e_2}{0.002}\ g}{0.253\ L \pm 0.005\ L}$$

for addition & subtract

$$e_3 = \sqrt{e_1^2 + e_2^2}$$

for multiplication & div

$$\left(\frac{e_c}{c}\right)^2 = \left(\frac{e_a}{a}\right)^2 + \left(\frac{e_b}{b}\right)^2$$

error

value

relative uncertainties

$c \pm e_c$

Sol: $= \dfrac{0.154\ g - 0.105\ g}{0.253\ L} = 0.1937\ g/L \pm ?$

$0.049\ g$

$? : e_3 = \sqrt{e_1^2 + e_2^2}$

$e_3 = \sqrt{0.002^2 + 0.002^2}$

$= 0.0028\ g$

$* 0.049\ g$

$$\frac{0.049\ g \pm 0.0028\ g}{0.253\ L \pm 0.005\ L} = c$$

$$\left(\frac{e_c}{0.1937}\right)^2 = \left(\frac{0.0028}{0.049}\right)^2 + \left(\frac{0.005}{0.253}\right)^2$$

$$e_c = c\sqrt{\left(\frac{0.0028}{0.049}\right)^2 + \left(\frac{0.005}{0.253}\right)^2}$$

$= \underline{0.01}$

Ans: $0.19 \pm 0.01\ g/L$