

PRIMER ON ERRORS

8.13 U.Becker

Feb, 2009

- ▣ **Random & Systematic Errors**
- ▣ **Distribution of random errors**
- ▣ **Binomial, Poisson, Gaussian**
- ▣ **Poisson \leftrightarrow Gaussian relation**
- ▣ **Propagation of Errors**
- ▣ **Fits -**

Read Bevington ch. 1-4

- **No measurement has infinite accuracy or precision”**
- *K.F.Gauss:*
- *“Experimental physics numbers must have errors and dimension.”*
- $G = (6.67310 \pm 0.00010)[\text{m}^3 \text{kg}^{-1} \text{s}^{-2}]$
- **Errors = deviations from Truth** (unknown, but approached)

Large error: Result is insignificant.

Small error: Good measurement, it will test theories.

Blunders : **no,no,** – repeat on Fridays correctly.

Random Errors or “statistical” - independent, repeated measurements give (slightly) different results

Systematic Errors “in the system”, DVM 2% low, ...
correct if you can, otherwise quote separate

Systematic error: inherent to the system or environment

Example:

Measure g with a pendulum: $T = 2\pi\sqrt{\frac{l}{g}}$

neglect m of thread)

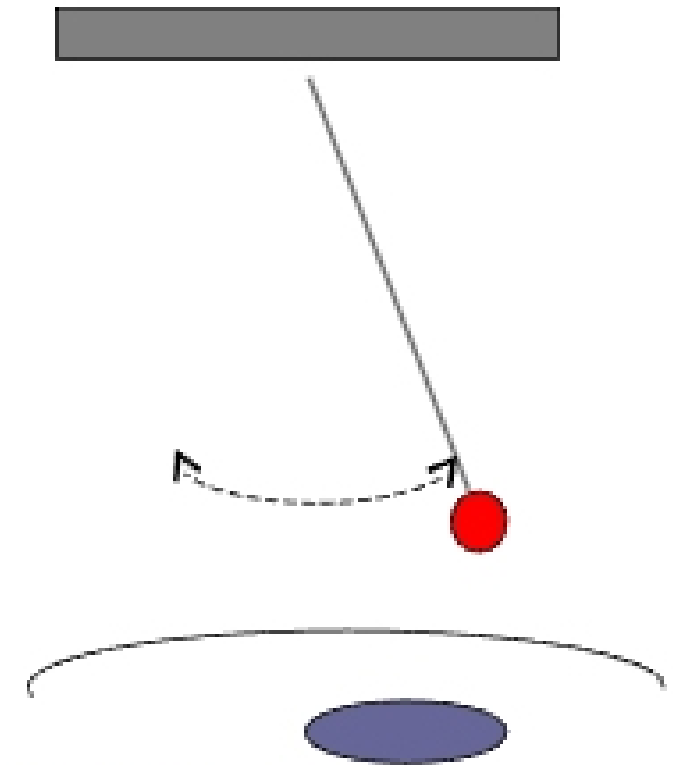
equipment (accuracy of scale, watch)

environment (wind, big mass in basement)

thermal expansion t

1. correct by $l = l_0(1 + \alpha t)$ if t known or

2. give sys. error Δ_l from est. range of t .



large M below earth

\Rightarrow limits ACCURACY (=closeness to truth)