Lab Write-up

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Our buckling load equation is

$$P = \frac{E\pi^3 D^3}{4L^2}$$

$$E = \frac{4PL^2}{\pi^3 D^4}$$

We can confirm the powers by plotting the data on log scales.

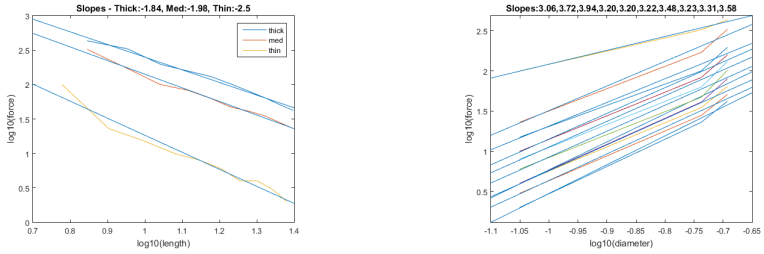

Figure 1: Averages for the slopes = -3.6 and 1.5

The ruler we used had an error of ± 0.5mm, and the scale had an error of ± 0.5g.

Calculating standard deviation of the length, radius, and pressure:

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=i}^{N}(x_i - \mu)^2}$$

$$\sigma_{length} = 5.8624,\ \sigma_{diameter} = 0.4539,\ \sigma_{force} = 109.6030$$

Error propagation given by

$$\delta q = \sqrt{(\delta x^2) + (\delta z)^2 + (\delta \omega)^2}$$

$$\frac{\delta E}{E} = \frac{4}{\pi^3}\sqrt{(\frac{2\delta L}{L})^2 + (\frac{-4\delta R}{R})^2 + (\frac{\delta P}{P})^2}$$

$$\frac{\delta E}{E}$$

$$Mean(E) = 5.4534 \frac{g}{cm * s^2} = 54.534 \frac{kg}{m * s^2}$$