7.1: Background Material

Text References

- ballistic pendulum
- comparing two uncertain results

Estimating Uncertainty

In lab #4, you were tasked with finding the coefficient of static friction two different ways, and comparing the results, to see if they agree within uncertainty. This lab consists of doing the same for kinetic friction. One of the procedures is a simple as can be, while the second is quite convoluted. In both cases, you will need to estimate the uncertainty, determine the "weakest link" percentage uncertainties, make the necessary calculations, and compare the results.

The usual approach to estimating an uncertainty (i.e. when one cannot determine it statistically with repeated trials) is to "take half the smallest grade of measurement." For example, this means that if you have a balance scale that can measure mass down to the nearest gram (i.e. trying one gram more or one gram less clearly unbalances the scale), then the uncertainty for this measurement is taken to be ± 0.5 grams.

Very often this is mistakenly taken to be half the smallest grade available on the measuring device, but this is not quite the same thing. As an example, consider once again a balance scale that measures mass. It may have a built-in mechanism for measuring down to 0.1 grams, but if the object being weighed doesn't become unbalanced with this small of a change, then this level of precision doesn't really express our uncertainty.

This means that we can't *really* make a good estimate of uncertainty for a measurement without having the measuring device in front of us so that we can tinker with it, to test its true sensitivity. This lab will provide photos and videos for measurements, and you will be expected to read off measurements. There are some measurements in this lab where the measurement is fairly clear, and others where you will have to make a reasonable guess of both the measurement and the wiggle room you need to give it in the form of absolute uncertainty.