Non-coding talks:

- **Tell a good story.** You are trying to verify a two block system behaves as expected according to Newton's Laws.
- Make your own figures, FBD's, and use the equation editor to write equations. Do not steal mine.
  - https://www.youtube.com/watch?v=f5Un3GaNxcA&list=PL4Sl1ZPMcTDVt4a2PadxWx9d3EWoBZV3n&index=8
- We typically try to show agreement with a theory (over a wide range of conditions) by showing plots with experimental data points matching theoretical curves.
  - Explain where you got your error bars:
    - Were they measurement errors associated with measuring mass or reading a ruler/protractor?
    - Were they statistical errors associated with getting the slope of a vt-plot?
  - If the experimental data points curve in the same way as the theory curve, you have good qualitative agreement.
  - If the 70% of the errors bars touch the theory curve, you have good quantitative agreement.
- For those of you with friction, a side goal is to also compute the coefficient(s) of friction.
  - You probably got $\mu_{exp} = \mu_{avg} \pm stdev$ using the AVERAGE and STDEV functions in Excel.
  - Express the experimental uncertainty as a percent using % **error** $\mu_{exp} = \frac{stdev}{\mu_{avg}} \times 100\%$.
  - You can also determine the discrepancy from whatever value I stated in the manual. This is called % **difference** $= \frac{\mu_{exp} - \mu_{rob}}{\mu_{rob}} \times 100\%$.
  - If % **difference** $\lesssim$ % **error** μ_{exp} we know your value for μ and my value for μ are in good quantitative agreement. In this context the symbol "$\lesssim$" implies "less than or *approximately* equal to".
- If you had a frictionless project, use your experimental values of a to compute g_{exp} from your FBD.
  - Here $g_{th} = 9.8 \frac{\text{m}}{\text{s}^2}$ while g_{exp} is found using every a_{exp} derived from force equations and your FBD.
  - You should get 30 or so values for g_{exp} so you can write $g_{exp} = g_{avg} \pm stdev$ using the AVERAGE and STDEV functions in Excel.
  - Express the experimental uncertainty as a percent using % **error** $g_{exp} = \frac{stdev}{g_{avg}} \times 100\%$.
  - You can also determine the discrepancy from whatever value I stated in the manual. This is called % **difference** $= \frac{g_{exp} - g_{th}}{g_{th}} \times 100\%$.
  - If % **difference** $\lesssim$ % **error** g_{exp} we know your value for μ and my value for μ are in good quantitative agreement. In this context the symbol "$\lesssim$" implies "less than or *approximately* equal to".
  - Note: you also have two contour plots to show (one for a_{exp} and one for a_{th}).
- On your conclusion slide you should summarize two of the previous three bullet points **WITH NUMBERS**.
- **WATCH OUT!** Error calculations (% difference, % error, stdev, etc) should be rounded to 1 sig fig.
  - Exception 1: If you have a 2 digit % I usually include two digits (i.e. -12% or 28%).
  - Exception 2: If the first digit is a 1, we usually include an extra digit (i.e. ± 1.6).
  - In general stdev has the same units as the average but %'s should never have units. If you are using stdev of a group of μ's the stdev has no units because μ has no units!

Coding talks

- **Tell a good story.** You wanted to input parameters and have the code behave appropriately according to the laws of physics.
- Include FBDs, force equations, and explain clearly how you used that info to create IF statements.
- Make your own figures, FBD's and use the equation editor to write equations. Do not steal mine.
  - https://www.youtube.com/watch?v=f5Un3GaNxcA&list=PL4Sl1ZPMcTDVt4a2PadxWx9d3EWoBZV3n&index=8
- Also include some details as to how you got from force magnitudes to force vectors in the code.
- Probably want a whole slide on that with FBD, force equation, as well as code snippet.
- Also explain the Euler-Cromer method for animation with code snippets (pronounced "Oiler-Cromer").
- Plan to display the code running under various sets of parameters. It may help to run the code with screen capture so you get exactly the look you want while saving us the headache of watching you fiddle with parameters live on screen…
- That said, be prepared to run the code under random cases I throw at you on the spot.
- Ensure your code actually outputs numerical values in some manner. Codes that might give you some ideas are linked below. You don't need all the sliders or buttons. Just print text on screen or use print statements. Side note: limiting sig figs on vectors is annoying but it is pretty easy on magnitudes.
  - https://www.glowscript.org/#/user/robjorstadahc/folder/ForceSims/program/Ball.on.rigid.rod
  - https://www.glowscript.org/#/user/robjorstadahc/folder/ForceSims/program/Atwoods01