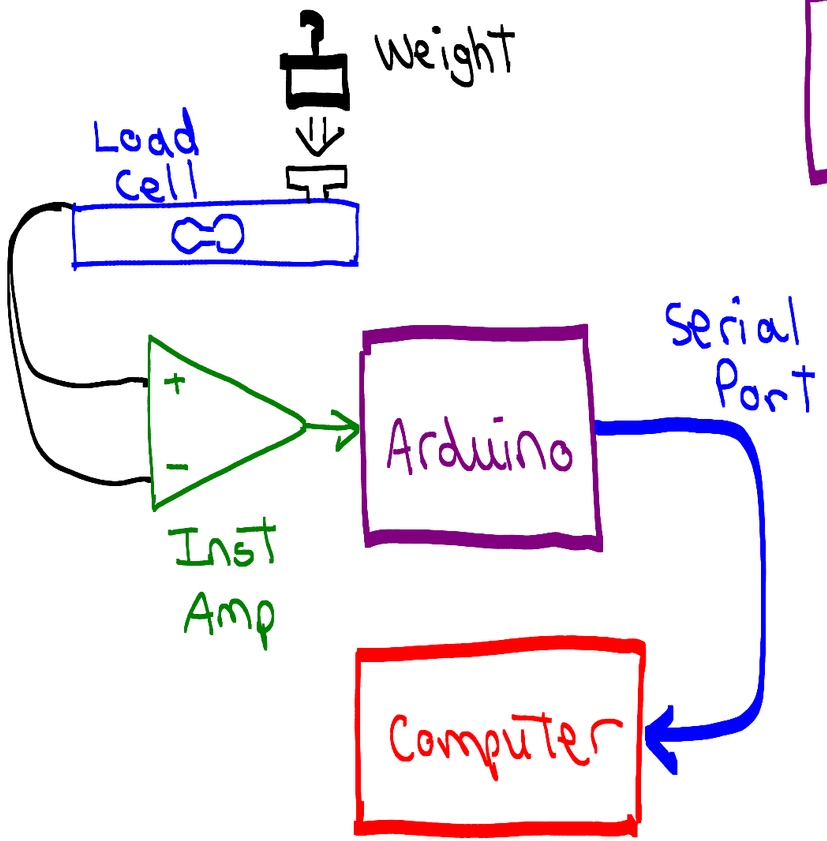
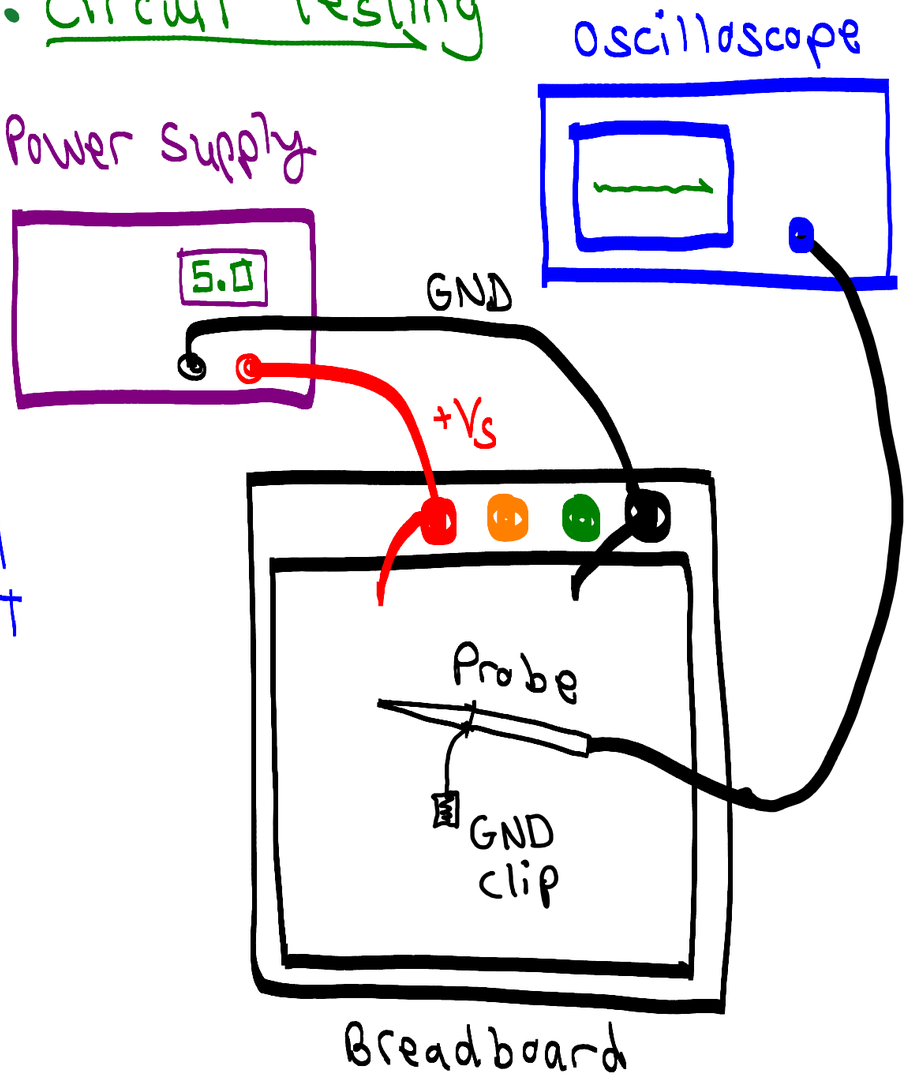
Lab 1 Tutorial

A. Experimental Setup



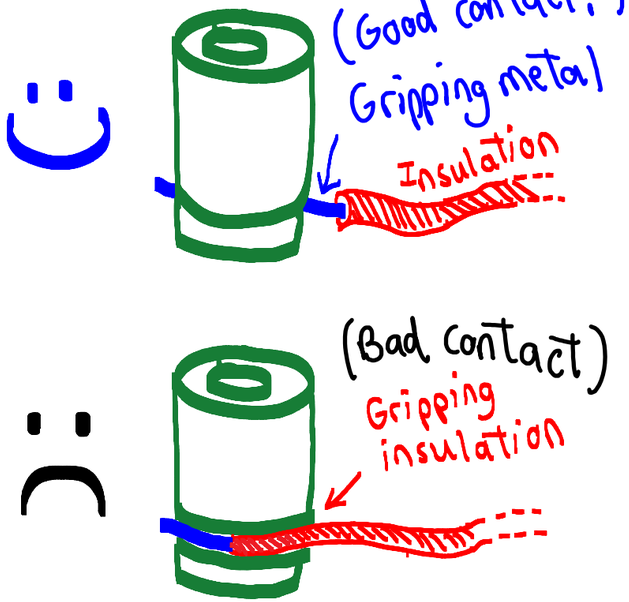
B. Circuit Testing



Circuit Construction

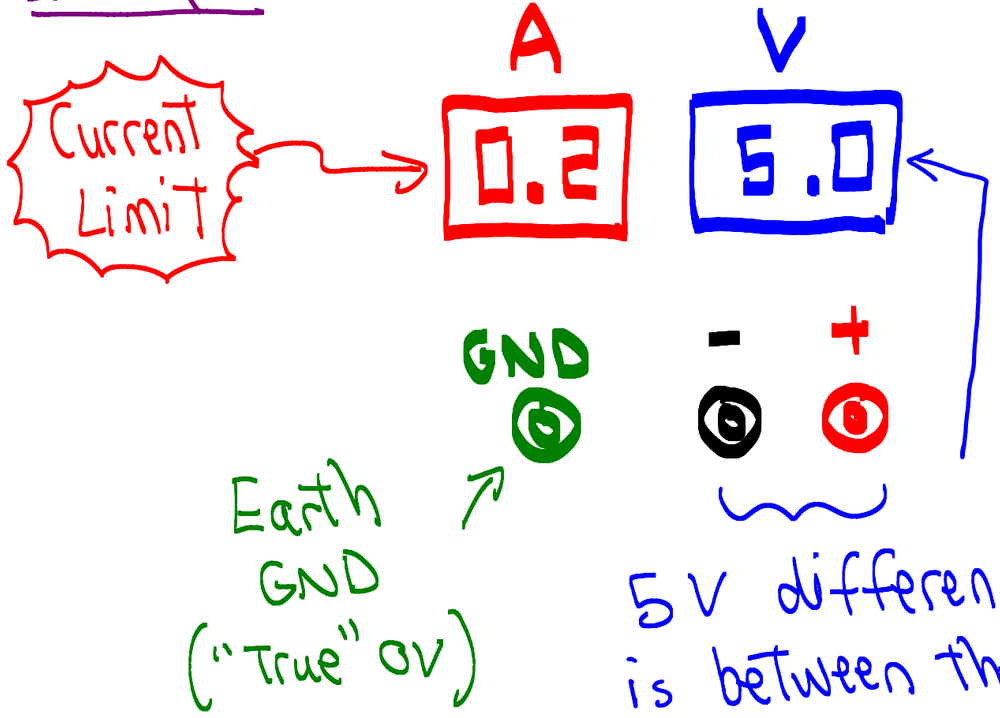
- Neat and color-coded wiring!
- Breadboard
- Terminals:

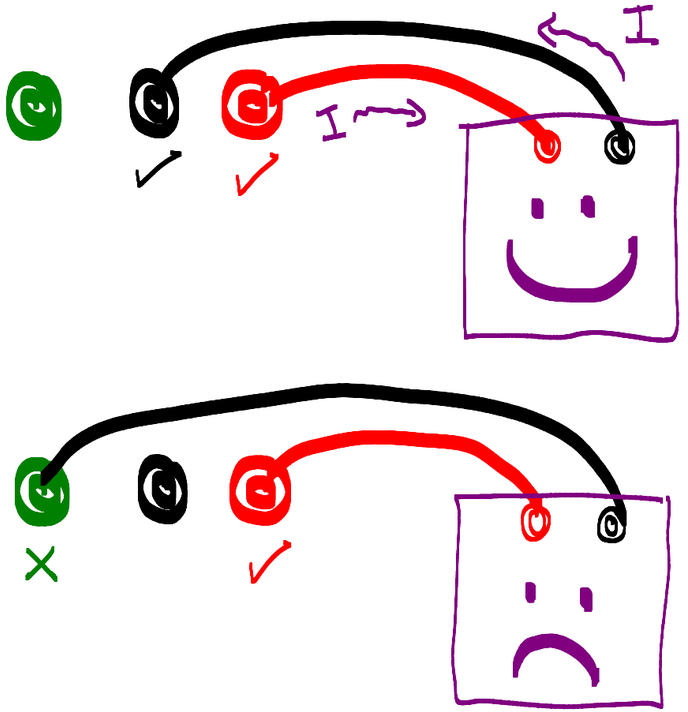
  Make sure you are gripping metal part of wire!



C. Power Supply

Example:

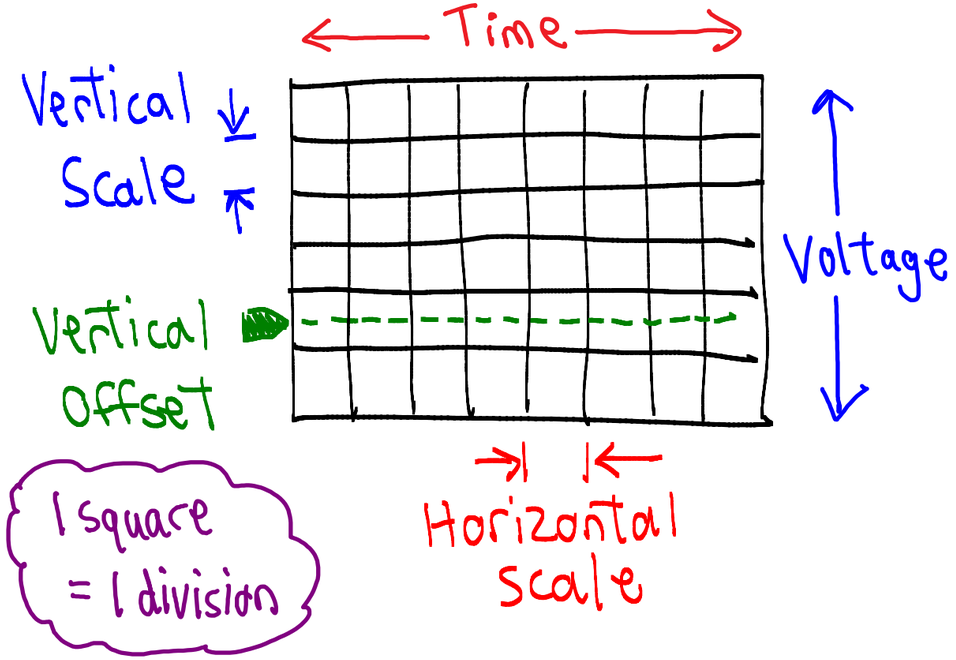


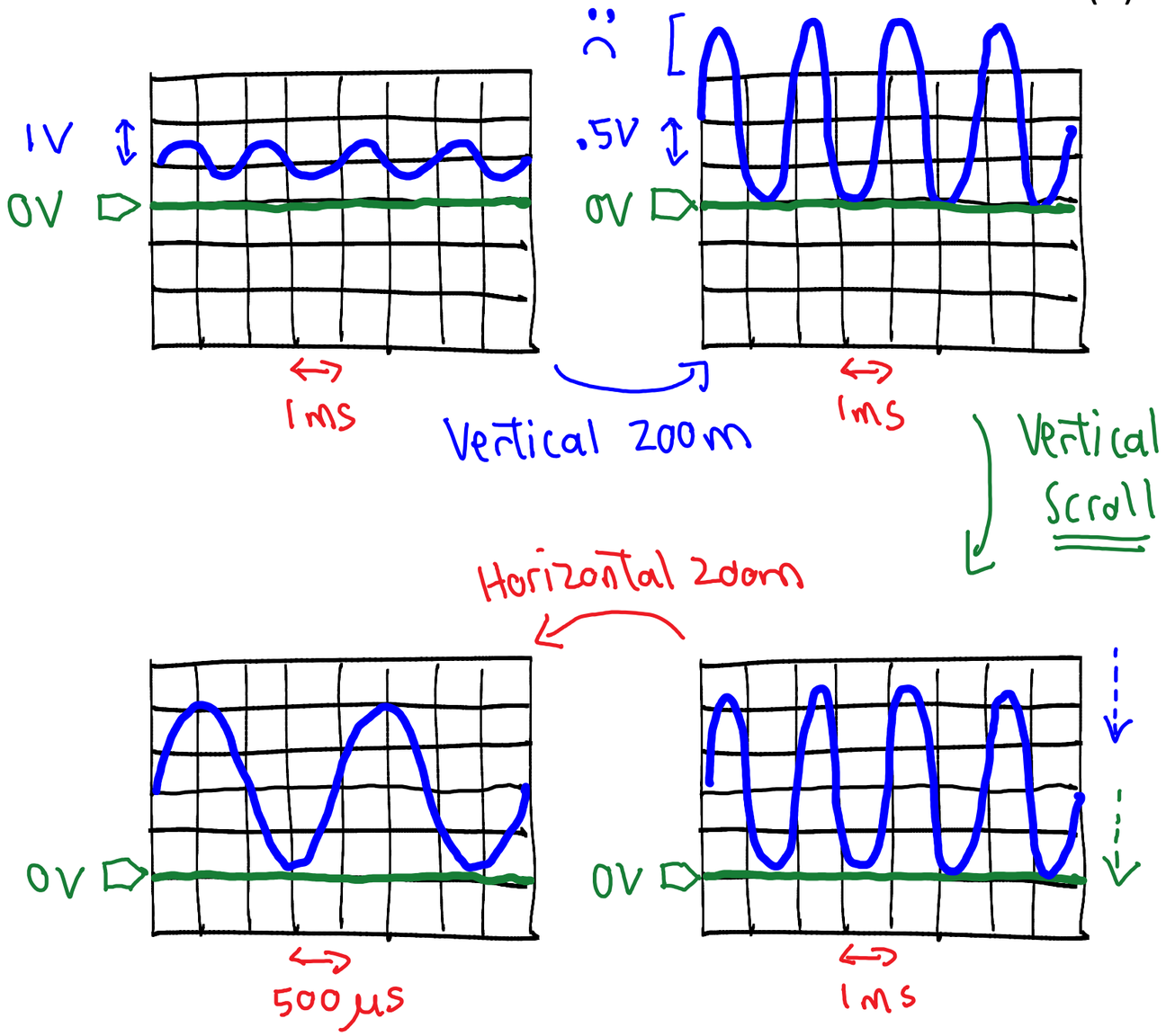


D. Oscilloscope

Scope display is like Google Maps.

→ Zoom in/out and scroll to properly display voltage waveform!





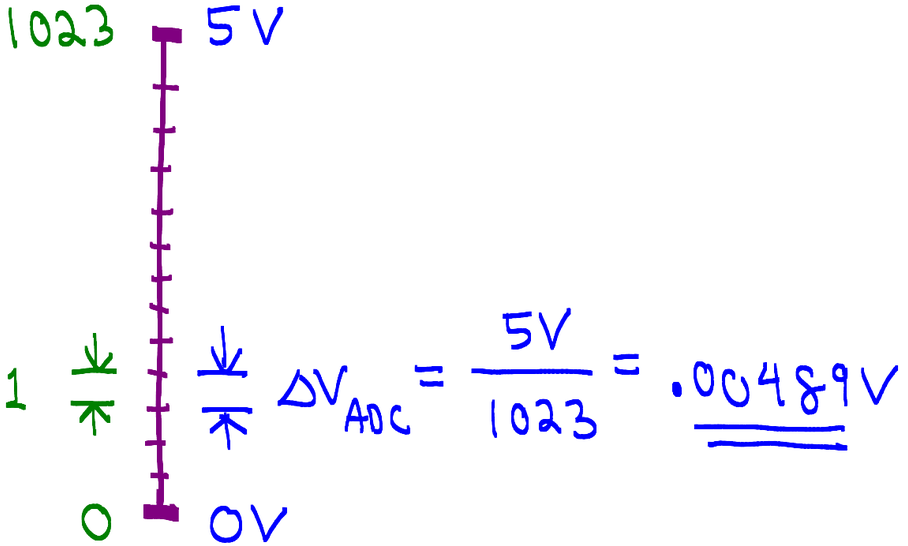
3. Arduino Programming

3.1 Warm-up Exercises

3.2 Data acquisition:

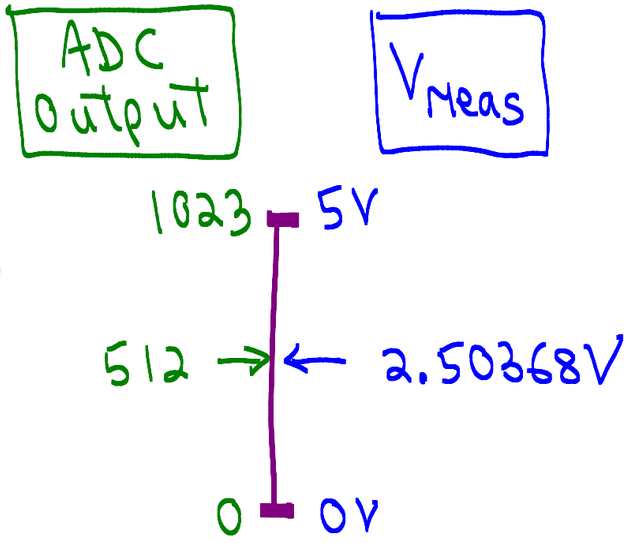
Integer ← ADC output

Voltage ← V_{meas}



$$\Rightarrow V_{meas} = (\text{ADC output}) \times \Delta V_{ADC}$$

Ex:



3.3 "Zeroing" the system

$$V_{meas} = V_{ref} + A_d \, RO \cdot V_s \cdot \frac{L}{L_{Rated}}$$

Our raw data is V_{meas}

→ How to compute corresponding L?

$$\Rightarrow L = \frac{L_{Rated}}{A_d \, RO \cdot V_s} \left(V_{meas} - V_{Ref} \right)$$

Adjust this value until L = 0 with no weight

3.4 Calibrating the system

- In reality, there will be slight error in values of A_d, RO, V_s

$$\Rightarrow L = \frac{L_{rated}}{K \cdot A_d \cdot RO \cdot V_s} \left(V_{meas} - V_{ref} \right)$$

Adjust this value until

[displayed load] = [known load]

☆ Calibrate AFTER zeroing the system!