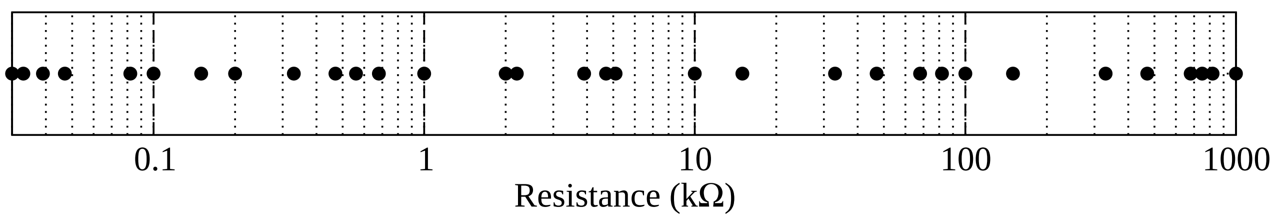
Lab Supplies: Physics 323: Electronics

1. **Resistors** ($k\Omega$ units):

0.030	0.033	0.039	0.047	0.082	0.10	0.15	0.20
0.33	0.47	0.56	0.68	1.0	2.0	2.2	3.9
4.7	5.1	10	15	33	47	68	82
100	150	330	470	680	750	820	1000
10 MΩ							

It is possible to display these values on a logarithmic plot. This is useful because the values cover several decades but also because it makes finding a ratio quite easy.



Suppose you want two resistors that have a ratio of 25. Print out the log plot and measure the distance between two of the decade lines (say it is 3.4 cm). You now know that any two dots separated by 3.4 cm are in the ratio of 10 to 1. To get different ratios you multiply the "decade distance" by $\log_{10}$(ratio). So continuing with our example $\log_{10} 25 = 1.40$ and the "ratio 25" distance is 4.76 cm. Look for dots that are 4.76 cm apart on the plot. I tried this with my chart and found the following pairs

R_1	R_2	Ratio
0.039	1.0	25.6
0.082	2.2	26.8
0.15	3.9	26
0.20	5.1	25.5
0.56	15	26.8
3.9	100	25.6
33	820	24.8

Keeping in mind that with 5% tolerance resistors all of these ratios have an uncertainty of 7% or ± 1.8 all of these ratios *are* 25.

Peter Marzlin suggested that you could put all of these resistors values in MatLab or some other programming language and then check all of the ratios. [I think my way is "slicker" (using the rules of logarithms in the same way they were used for an old slide rule) but potentially more confusing.]

2. **Capacitors**: There aren't nearly as many capacitors. We have 100 pF and then several μF values: 0.01, 1, 4.7, 15, 100, and 470.

3. **Poteniometers** *aka Variable Resistors*: These have 3 connecting pins that plug into the breadboard. The “outer” pins always have the same resistance between them and the centre pin has a variable resistance to each of the outer pins. They come in 10 kΩ and 100 kΩ varieties labelled “103” and “104”. Some of them require a screwdriver for adjustment.

4. **Handheld Digital Multimeters**: Every experimental station has one of these extremely useful devices. Consider is one of your best friends. The inputs “float” so you can connect it to any part of the circuit. You will have enough accuracy for most measurements you make in the lab provided you choose the correct scale. In addition to voltage and resistance you can also measure capacitance (although it is a pain to get short leads into the slots) and h_{fe} of transistors (there may be a slick adapter in your supplies to help with this). It is battery operated so try and shut it off when finished. Also make sure to correctly select AC and DC.

5. **Simpson Meter**: Some things around the physics labs look old and are really obsolete. This is one device that looks old but is extremely useful for measuring electric currents, particularly in the microampere range. Currents are “positive” when they go in the red lead (which plugs into different places depending on the range you want to measure) and out the black lead (connected to “COMMON”). They are equipped with circuit breakers so if you hear a “click” check your circuit and then reactivate by pushing in the white button. They don’t seem to have an “ON/OFF” switch. The scale is labelled by its value at full deflection of the needle. So if you are on the 50 μA scale then take your readings from the “0 10 20 30 40 50” row of numbers.