0.1.1 What do you measure with Probe in 10A (or equivalent A slot) and COM? What do you measure with Probe in V/mOhm etc. and COM? If you incorrectly measure something that does not correspond to the correct probe: what are things that can happen and why?

With the probe connected to 10A and COM we measure current flowing through the circuit/ terminal(mostly high AC appliances/outlets).
With the probes connected to V/mOhm and COM we measure the voltage across 2 points in a circuit. Also, measure the resistance in a circuit/ component. Also, continuity tests are performed in this configuration.
If we incorrectly measure something, the fuse inside the DMM might blow, potentially damaging the multimeter's internal circuits.

0.1.2 What things can your multimeter measure? Not all DMMs are the same so it is important to know what the one you have can do, and how to connect it to correctly measure what you want.
It can measure Voltage, current, resistance, capacitance and continuity in a circuit, and some DMMs can even measure temperature!! Some advanced multimeters can also measure frequency, duty cycle, and test transistors.

0.1.3 Find a battery and measure the voltage across the battery. Is this what you would expect? Does it match the voltage stated on the battery? If not, why?

I tested a 9V battery, but the DMM measured 7.3V, indicating that the battery is discharged. This lower voltage could result from internal resistance or battery age.

0.1.4 A connectivity test is used to determine if two points are connected with very little resistance (shorted). Sometimes these things are supposed to be connected, sometimes they are not, and a connectivity test can help determine if things are connected properly. This is a very useful function of the DMM. Change the setting on the multimeter to do a connectivity test to determine what parts of your workstation are shorted together. Write down 2 things that are connected. Note: The DMM will beep if things are shorted together, however, if the batteries are low in the DMM it may not beep. You should still see a reading on the device if there is low or high resistance.

I connected a resistor and a diode and tested continuity across them. The multimeter beeped when the connection was continuous.

0.2.1. Turn the voltage knob. Does the current display change as you do this? Why or why not? Does anything happen to the CV and CC lights? Turn the current knob all the way counter clockwise (to 0). Does the voltage display change as you do this? Does anything happen to the CV and CC lights? Connect the '-' and '+' pins together and turn the knobs. What happens now? (Be careful not to turn the current knob too high or for too long when connected, as the wires will get very hot, possibly melt).

The current display does not change because there is no circuit to complete the current flow. The CV and CC lights remain unaffected.

0.2.2 Using the DMM, measure the voltage difference between the (-) and (+) outputs as you adjust the voltage knob. Do the multimeter and the power supply agree? Does the current display show any current? Now measure the voltage between the ground and positive terminals. See if you can explain the difference between the ground and negative (black and green) terminals.

Yes, they agree. No, the current display does not show any current reading. The ground terminal is a reference point and may not be directly connected to the negative terminal in all configurations. It serves as a common reference for measurements.

0.3.1 Use the DMM to measure a variety of resistors from 1KΩ to 10MΩ. Write out a table of results. Combine resistors to vary resistances. Are the readings within tolerances? Were you touching Use the DMM to measure a variety of resistors from 1KΩ to 10MΩ. Write out a table of results. Combine resistors to vary resistances. Are the readings within tolerances? Were you touching it? If the readings are different, why?

Comparing the results, I would say the readings are within tolerances. I was touching the resistors at first while measuring and then again took the readings without touching them. Touching the resistor affects the reading because your body introduces parallel resistance. This creates a lower equivalent resistance, altering the measurement.

Resistor	Actual Value	Measured Value
1	1KΩ	997Ω
2	10KΩ	9.67KΩ
3	33KΩ	31.6KΩ
4	56KΩ	55.8KΩ
5	100KΩ	93KΩ
6	180KΩ	178.5KΩ
7	330KΩ	333KΩ
8	560KΩ	551KΩ
9	1MΩ	1MΩ

0.3.2 Connect the same range of resistors to a 5V supply. Use the power supply current reading to determine how much current is flowing through the circuit. Write a table with expected current (Ohm's Law) vs. actual current measurement and the resistance values used. Do the values match? If not, why do you think this is happening?

Resistor	Actual Value	Measured Value	Expected Current (Amp)	Actual Current (Amp)
1	1KΩ	997Ω	0.005	0.006
2	10KΩ	9.67KΩ	0.0005	0.001
3	33KΩ	31.6KΩ	0.0001	0.001
4	56KΩ	55.8KΩ	0.0001	0.001
5	100KΩ	93KΩ	0.00005	0.001
6	180KΩ	178.5KΩ	0.000002	0.001
7	330KΩ	333KΩ	0.000001	0.001
8	560KΩ	551KΩ	0.0000008	0.001
9	1MΩ	1MΩ	0.0000005	0.001

From the table above, it is clear that there is not much difference in the expected and actual value. This is because of the high resistance value minimal/no current is flowing through the circuit. The difference between expected and actual current may result from meter accuracy, connection resistance, or rounding errors in measurements.

0.3.3 Find a 10 ohm resistor. Given the power rating of the resistor, what is the maximum current you should apply through this resistor? Apply this current rating using the power supply. Measure the voltage drop across the 10 ohm resistor using the DMM. Does this match voltage displayed on the variable power supply? Does this fit what you would expect from the V=IR relationship? If not, why do you think this is happening?

P = I^2R

I = $\sqrt{\frac{P}{R}}$

Resistor value(R) = 10 Ohm

Resistor power rating(P) = ¼ watts = 0.25 Watts

Therefore,

I = $\sqrt{\frac{10}{0.25}}$

= **0.158A**

After supplying a current of 0.158A, the bench power supply shows a voltage of 1.6V and I am getting 1.52V on the multimeter. So yes, the readings do match.The voltage drop readings on the power supply and multimeter were slightly different due to calibration differences or connection resistance.

0.4.1 Repeat 0.3.3 with the scope and probe set to 1X. Then repeat it with both set to 10X. Is the result different? If so, why? Regardless of your findings, why would this feature be included?

There is no difference between the 10x and 1x results.The 10X probe reduces the loading effect on high-frequency signals, allowing more accurate readings in complex waveforms.

0.5.1 Connect the function generator to the scope and test the different wave functions. You will need to adjust the scope settings, and you may need to change the power range on the function generator as well. Feel free to explore different settings to get a better sense of both machines. What does the duty cycle do to each of them?

The duty cycle changes the proportion of the wave that remains in the 'high state' for square waves. It does not affect sine or sawtooth waves significantly.

0.5.2 Adjust the offset of a square wave so that it is always positive. What happens when you now change the amplitude by a factor of 15?

When the amplitude increases by a factor of 15, the waveform stretches vertically. This change reflects the increased peak voltage.

0.5.3 Change the frequency of the signal by a factor of 1000 and set it to a sine wave. Adjust the scope so you can see the signal, and trigger it on a falling edge. What happens when you move the trigger up and down? How is this different from what happens with a square wave?

Adjusting the trigger changes where the scope starts displaying the waveform. For sine waves, this shifts the starting phase. For square waves, it changes the threshold point for the transition between high and low states.