Solving for Resistance

Electrical devices work through the flow of electrons, which are charged particles. For an electrical circuit to work, it must have something that provides power (like a battery), something that consumes power (like a resistor), and wires must connect everything in a circle, so the electrons can flow. The battery has a given *voltage*, which provides the "umph" needed to get the electrons flowing. We call the flow of electrons *current*.

How much current flows depends on the voltage of the battery and the resistance of the resistor. According to the famous electrical engineering equation Ohm's Law,

Voltage = Current · Resistance

$$V = I \cdot R$$

Today we will apply our math skill of solving equations to solve a real-world electrical engineering problem. Our goal is to calculate the resistance of a mystery resistor. We will make measurements, which we can then use to solve the equation for Ohm's Law.

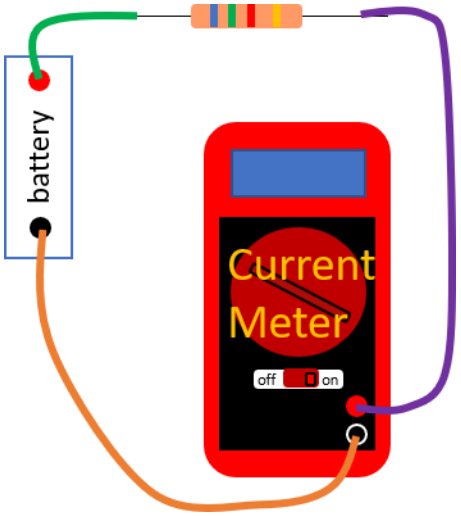
1. Rearrange the variables to solve for resistance R.

$$R =$$

2. To figure out the resistance of the mystery resistor, we must know the voltage and the current. The voltage across the resistor is just the voltage of the battery we connect to it. To measure the voltage of 1 AA battery, connect the VOLTAGE METER to each end of the battery (as shown below). Connect RED to RED and BLACK to BLACK (otherwise you will measure a negative number). Make sure you turn the voltage meter on.

$V =$

3. To measure the current (I) through the resistor, connect the AA battery, the mystery resistor, and the current reader in a circle (shown below). Connect the BLACK end of the battery to the BLACK wire from the current meter (or you will get a negative number). Make sure you turn the current reader on.



Resistor Card

I =

4. Using the measurements for V and I, you should now be able to solve for R:
(Hint: Look at your answer to 1 for how to solve)

R =

5. Repeat the measurements for voltage (V) and current (I) but with 3 AA batteries connected together as follows this time (this will increase voltage). Make sure all the red knobs are facing the same direction. What did you measure for V, I, and R this time?

V =

I =

R =

6. Did you get the same value for resistance each time? Why or why not? If you got different numbers, what do you think the actual resistance is based on your two different measurements?

7. *Predict:* If you used the same resistor and a 9 volt battery instead (voltage = 9), what would be the current?

I =

8. *Design:* If you are using 3 AA batteries and want a current of 10, what resistance resistor do you need?

R =