Electronics Merit Badge

Class 2

Resistance

- Resistance is an electrical property of a material that “resists” the flow of electrons.
- The schematic symbol for a resistor is: 
- Common units for resistance are:
  - Ohms
  - Kilohm: 1K= 1000 ohms, 10K = 10,000 ohms
  - Megohm: 1M = 1,000,000 ohms
- The units symbol for ohms is: Ω (ohms)

Current

- Current: Defined as "flow of electrons".
- Current: Units of current is AMPS.
- Current: Electrical symbol for current is I.
- Common units for current are:
  - Amps
  - Milliamps (ma): 1 ma = .001 amp
  - Microamps (ua) : 1 ua = .000001 amp, or .001 ma
  - Nanoamps (na) : 1 na = .000000001 amp or .000001 ma, or .001 ua.

Voltage

- Volts is the electrical force that causes electrons (current) to flow.
- Units of volts is VOLTS.
- The symbol of volts is E or V. We will use V.
- Common units for voltage are:
  - Volts
  - Millivolt (mv) : .001 volt.
  - Microvolt (uv) : .000001 volt, or .001 mv
  - Nanovolt (nv) : .000000001 volt, or .000001 mv, or .001 uv.

Ohms Law

- One of the most important laws in electronics/electricity.
- V = I x R : Voltage = Current x Resistance
- Volts is measure in VOLTS, current is measured in AMPS, and resistance is measured in OHMS.
- 1 AMP, going through 1 OHM of resistance, generates a voltage drop of 1 VOLT.
- 1 V = 1 A x 1 Ω.

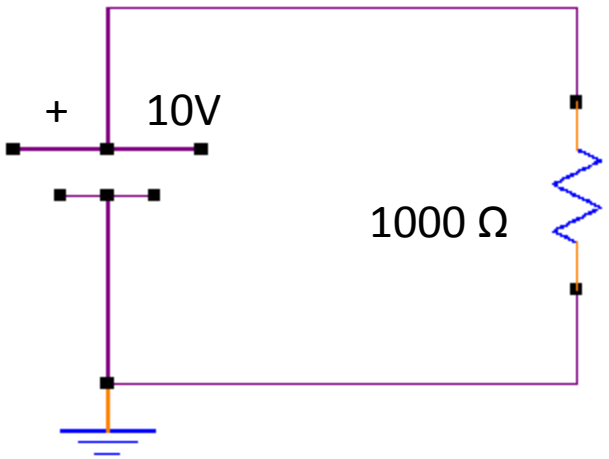
More Ohm's Law

Different forms of Ohm's Law:

V = I x R : Voltage = Current X Resistance

I = V / R : Current = Voltage / Resistance

R = V / I : Resistance = Voltage / Current



Volts = 10.

Resistance = 1000Ω

Compute current.

I = V / R

I = 10 / 1000 = .01A

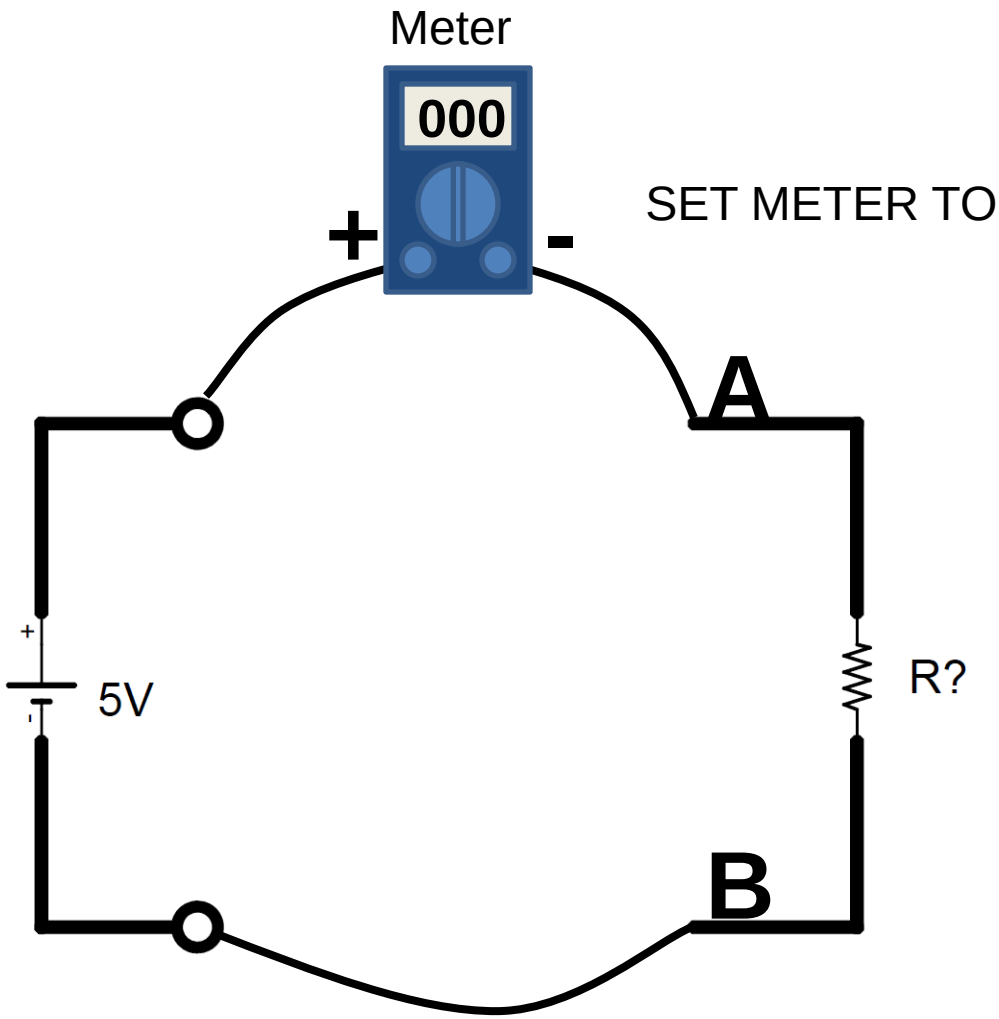
.01A = 10ma

Question: what would the current be if the voltage was 1 V? How about 1000 V?

Ohm's Law Exercise

- Using a meter, we will measure some resistors.
- Then, using ohm's law, we will calculate the resistor's values. To do this, we will use the meter to measure current and voltage in a circuit.

Ohms Law – Step 1

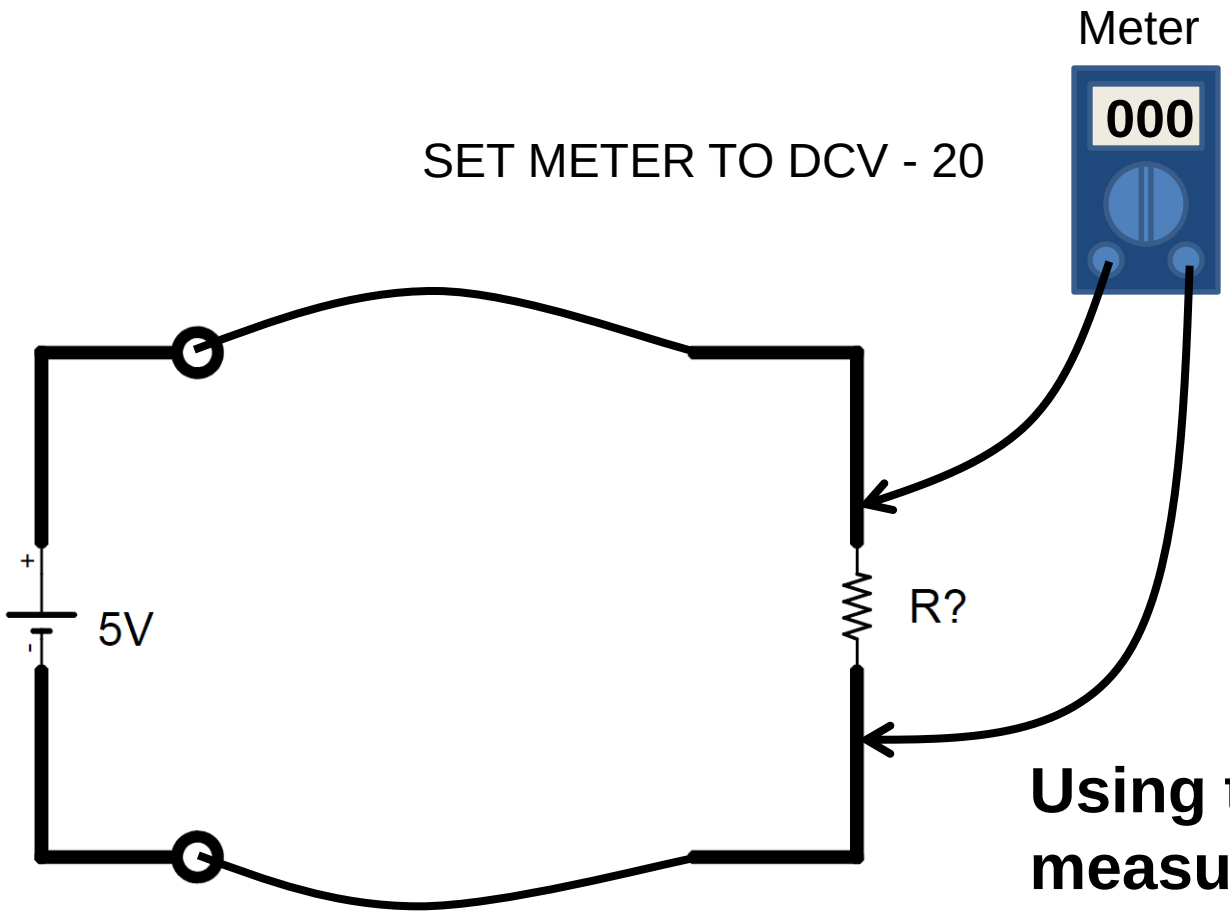


SET METER TO DCA -20m

Using the meter, measure current.

I = _____ amps

Ohms Law – Step 2



Using the meter, measure voltage.

V = _____ volts

Ohms Law – Step 3

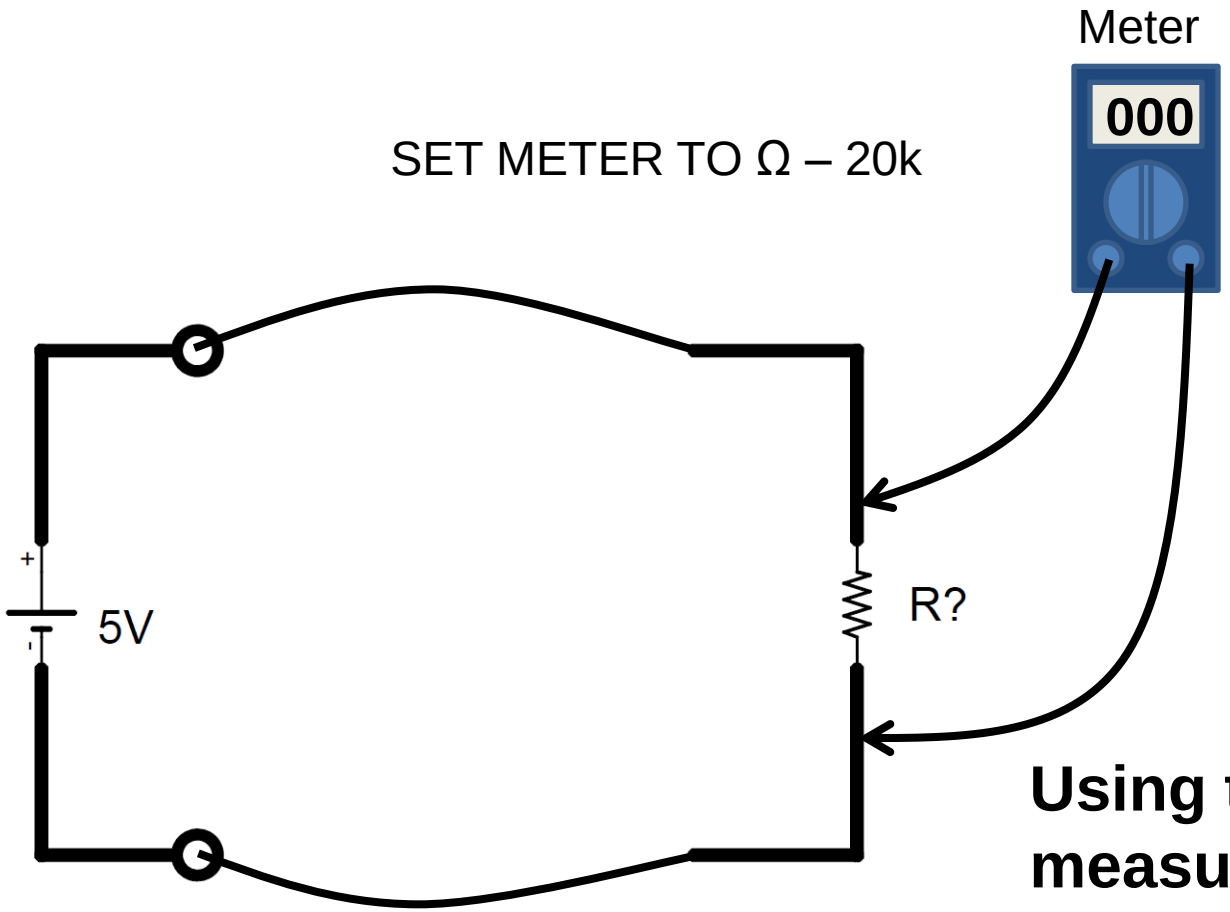
Calculate resistance from your 2 measurements.

Ohms Law : V = I x R.

Therefore, $R = V / I$ <- Use this equation.

Note: you will be measuring current on the 20ma range, so a value of 2.5ma needs to be written as .0025A when using this equation.

Ohms Law – Step 4



Using the meter, measure Resistance.

R = _____ ohms

How does this compare with your calculated value?