COMP140 Individual Creative Computing Project

Register Attendance

Figure 1: Attendance monitoring is in place. It is your responsability to ensure that you have signed yourself in.

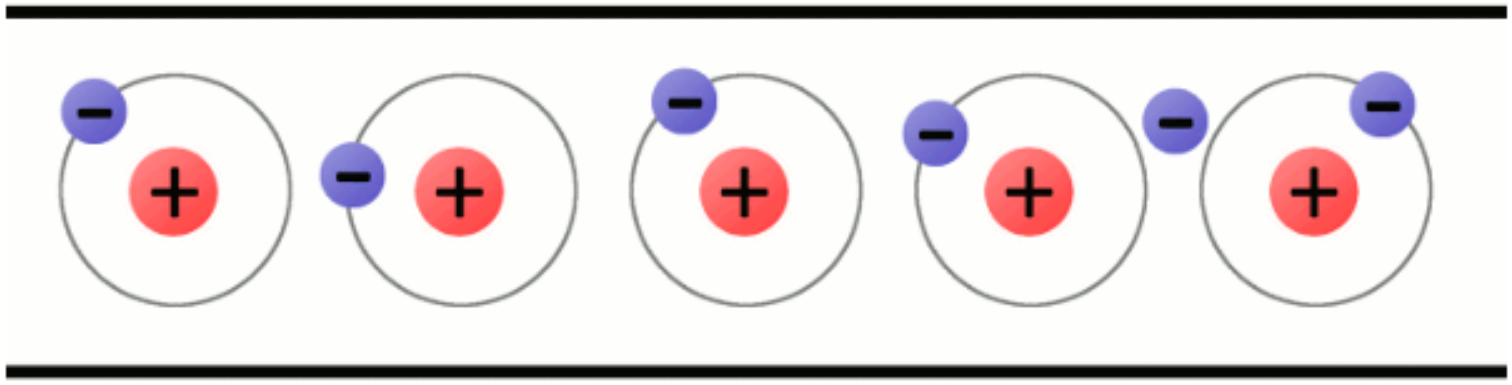
Learning Outcomes

After this session you will be able to:

- **Exlain** the difference between current, voltage, and resistance
- **Predict** the characteristics of basic circuits using simple formulas
- **Choose** components based on their purpose and characteristics

What is current electricity?

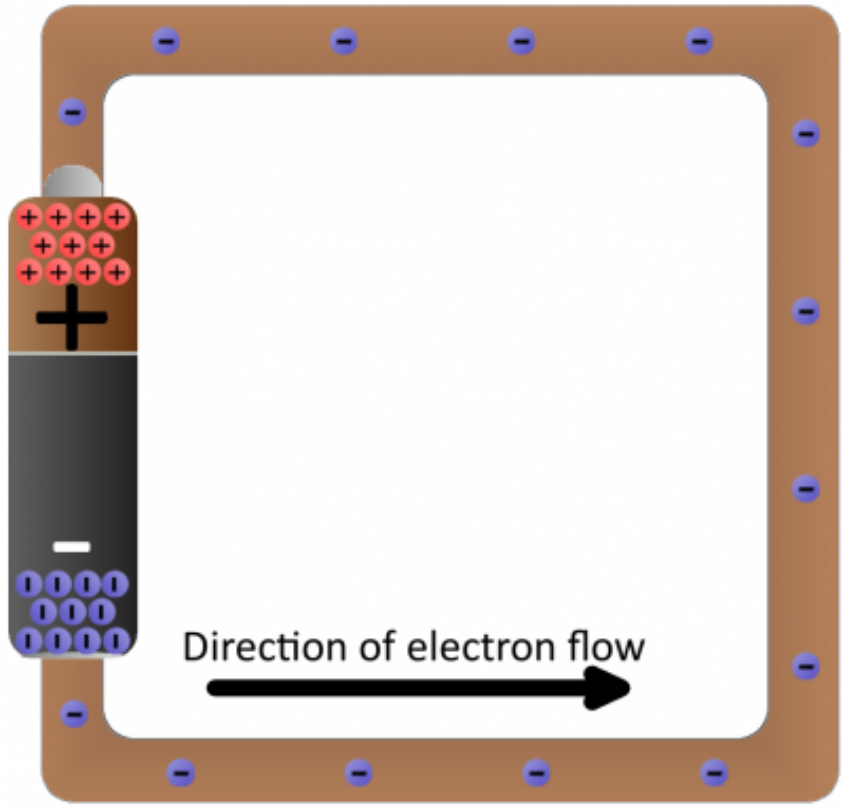
(the stuff that makes our gadgets tick)



source:https://learn.sparkfun.com/tutorials/what-is-electricity/allrmar

- The flow of electrons through
- a closed circuit (wire, components, etc)
- Induced by an electric field (battery)

Battery Example



source:https://learn.sparkfun.com/tutorials/what-is-electricity/allrmar

Basic characteristics

- **Voltage (V)** - The relative level of electrical energy between any two points in a circuit. Voltage is measured in *volts*.
- **Current (I)** - The amount of electrical energy passing through any point in a circui. Current is measured in *amps*
- **Resistence (R)** - The amount that any component in the circuit resists the flow of current. Resistence is measured in *ohms*

Water Analogy

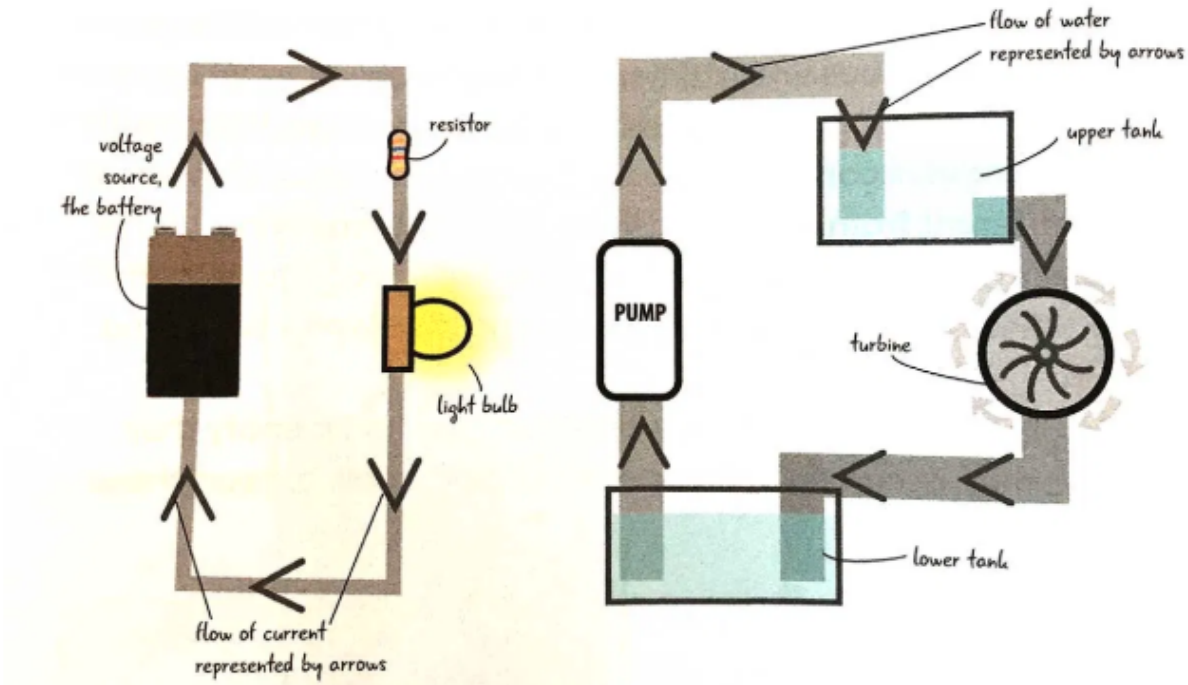
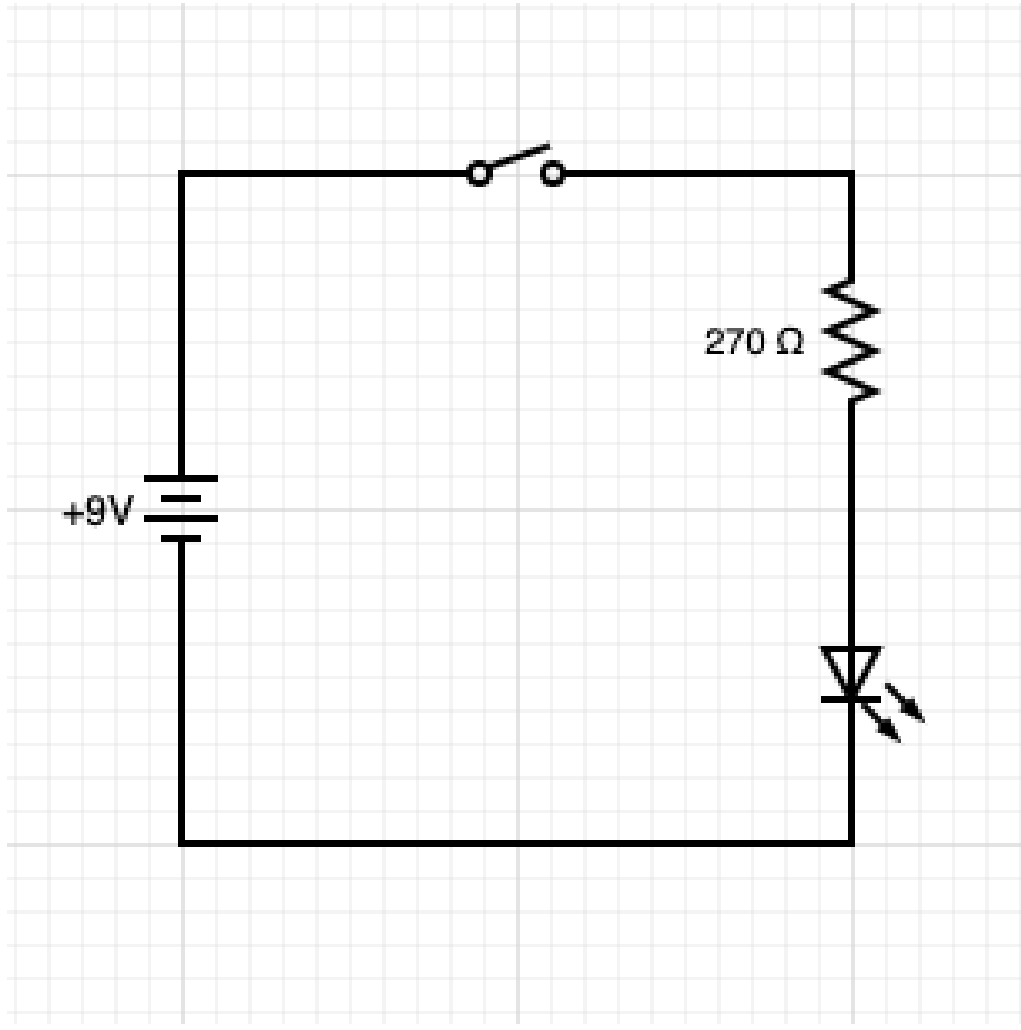


FIGURE 5.34: Water analogy for electricity

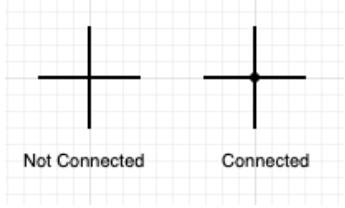
Hagan,J.(2017). Learn Electronics with Arduino. Maker Media, Inc

Reading Schematic Diagrams

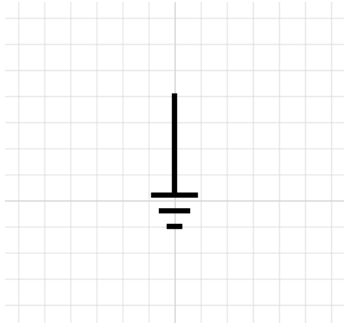


The Rules

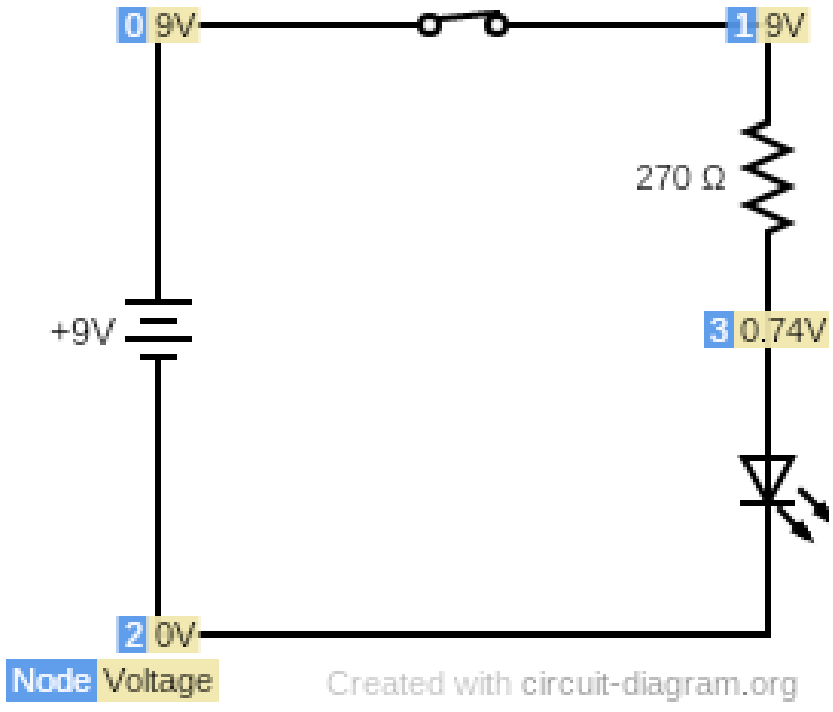
- Positive volatages are uppermost
- Things happen left to right
- All components have a name and values
- Remember symbols
- Dots show that the wires are connected:



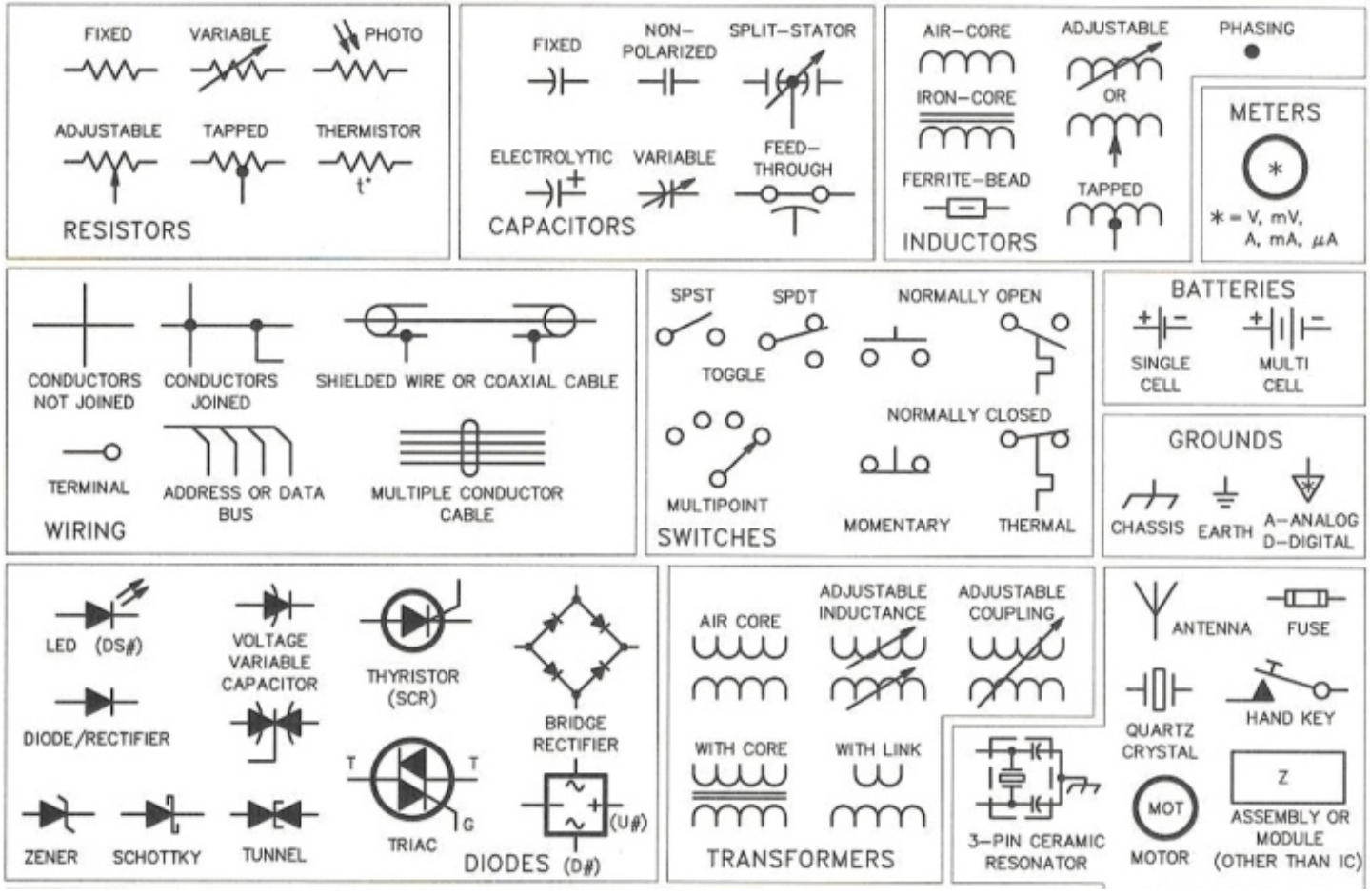
- Nets: Inferred connection based on symbol or name:



Reading Schematic Diagrams (answer)

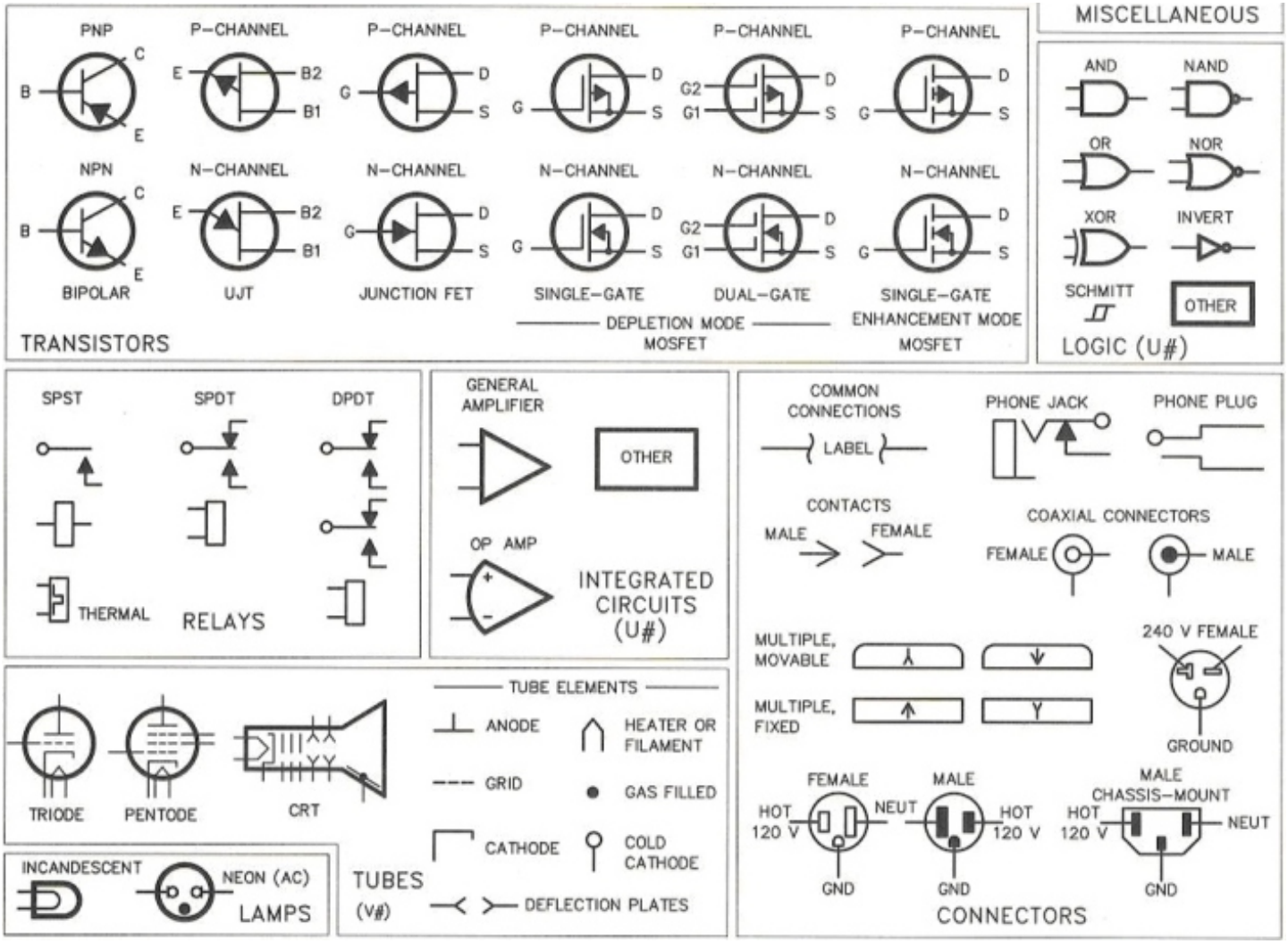


Schematic Circuits 1



source:https://www.autodesk.com/products/eagle/blog/how-to-read-your-first-autode

Schematic Circuits 2



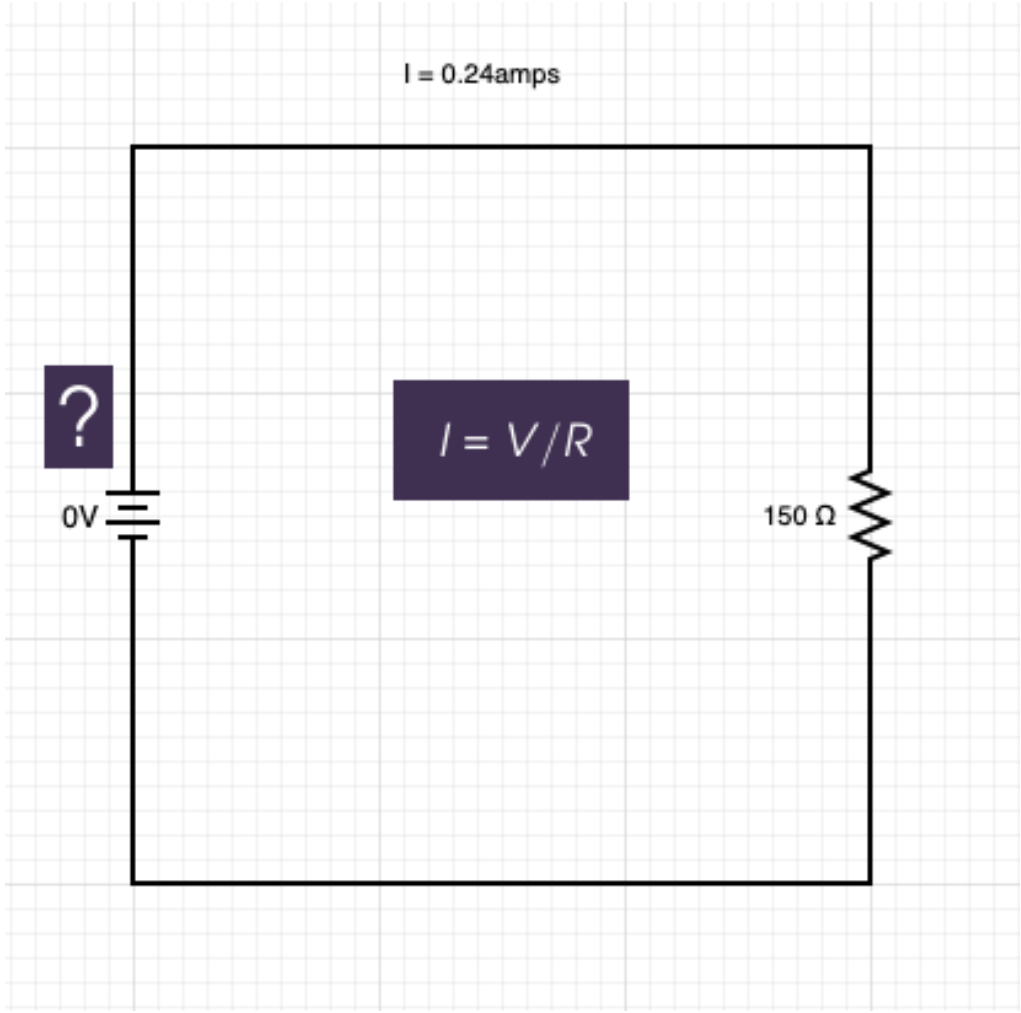
source:https://www.autodesk.com/products/eagle/blog/how-to-read-your-first-autode

Ohm's Law

$$I = V/R$$

- If the voltage increases, whe the current (a) increase or (b) decrease.
- If the resistance increases will the current (a) increase or (b) decrease.

Ohm's Law Example 1



Ohm's Law Example 1 - Answer

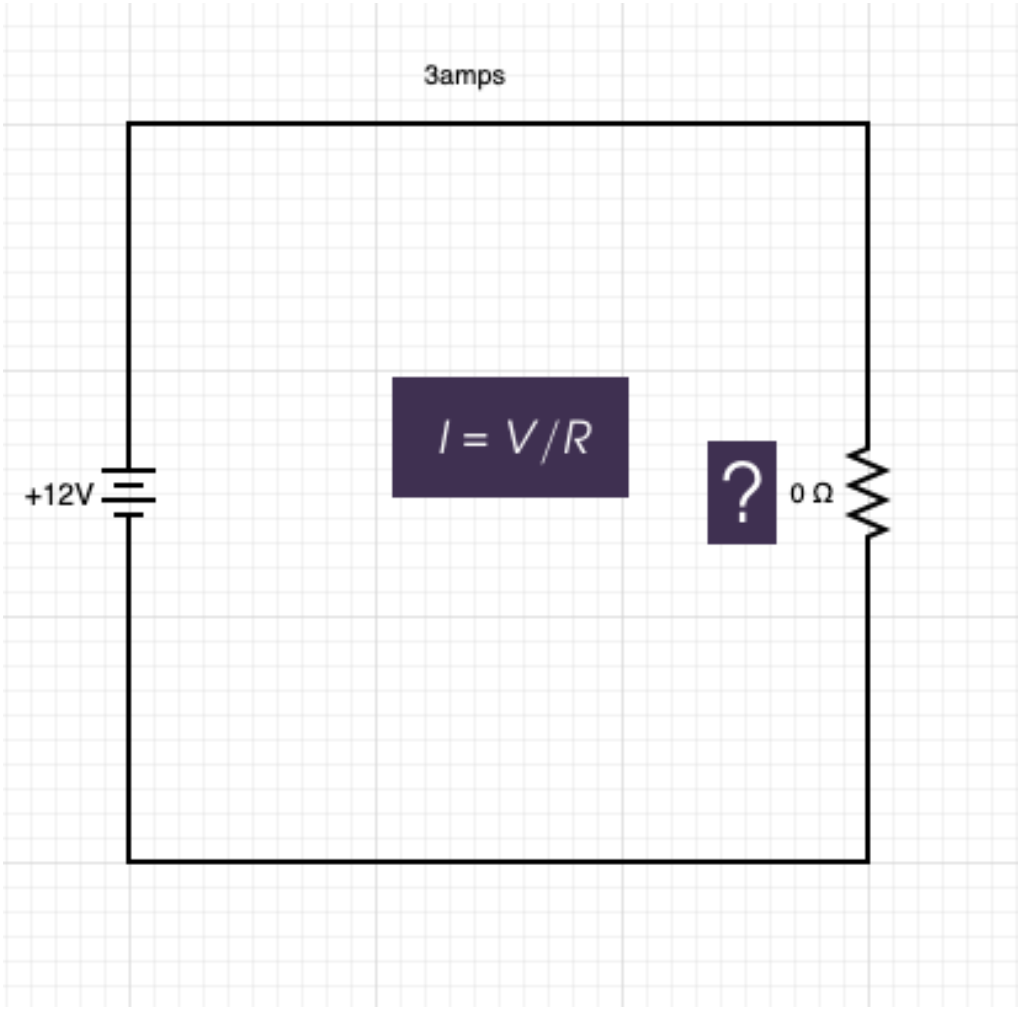
$$I = V/R$$

$$0.24 amps = ?/150 ohms$$

$$V = 0.24 * 150$$

Answer = 36 Volts

Ohm's Law Example 2



Ohm's Law Example 2 - Answer

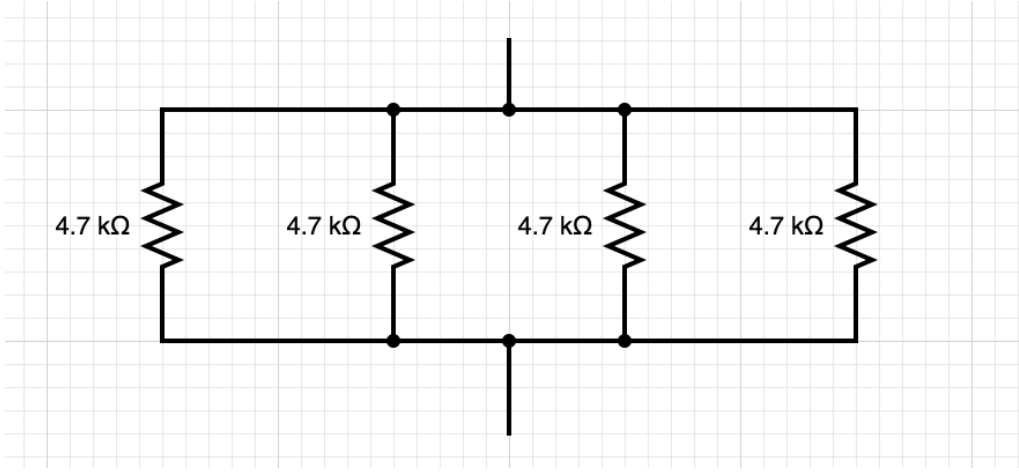
$$I = V/R$$

$$3amps = 12volts/?$$

$$R = 12/3$$

Answer = 4Ohms

Resistors (Series vs. Parrallel)

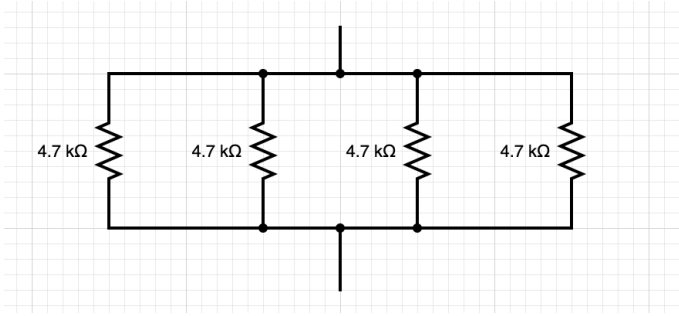


Series

$$R_T = R_1 + R_2 + R_3 + R_4$$

$$R_T = 4700 + 4700 + 4700 + 4700 = 18000 ohms = 18 kohms$$

Parallel



$$Conductance(G) = \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$$

Then calculate the resistance based on the reciprocal:

$$Conductance(G) = \frac{4}{4700} Reciprocal = \frac{4700}{4}$$

Resistance = 1175ohms = 1.175kohms

Power Dissipation (Watts-W)

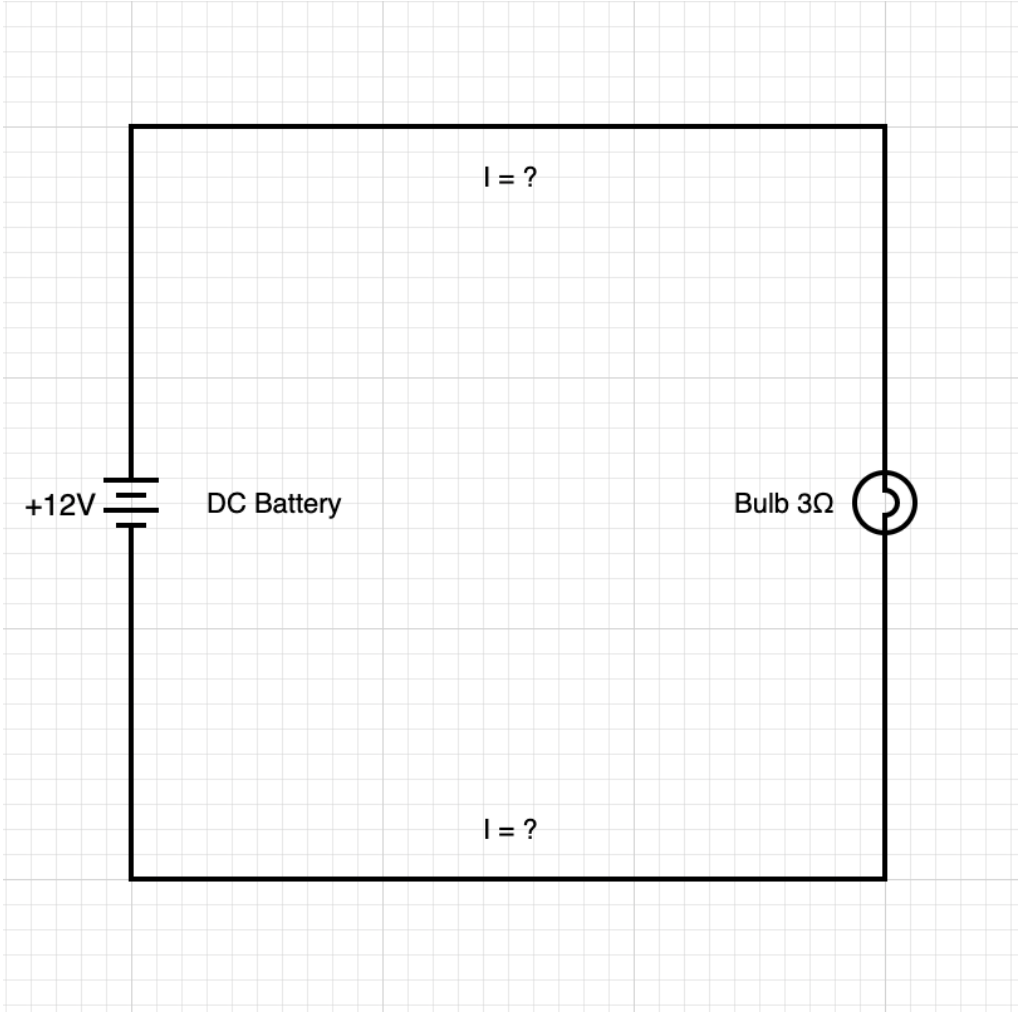
Similar to current, Power is a measure of change over time. Instead of charge, power is the amount of energy converted into heat over time.

- When the flow of current is resisted, heat is generated
- Calculated by measuring the voltage across a load times the current flowing through it

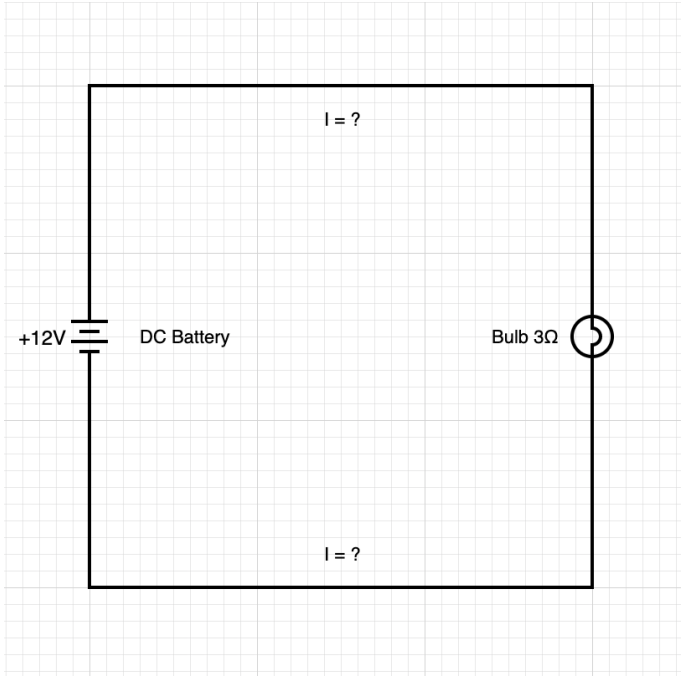
$$P = I * V$$

$$P = V^2 / R$$

Power Example



Power Example Answer



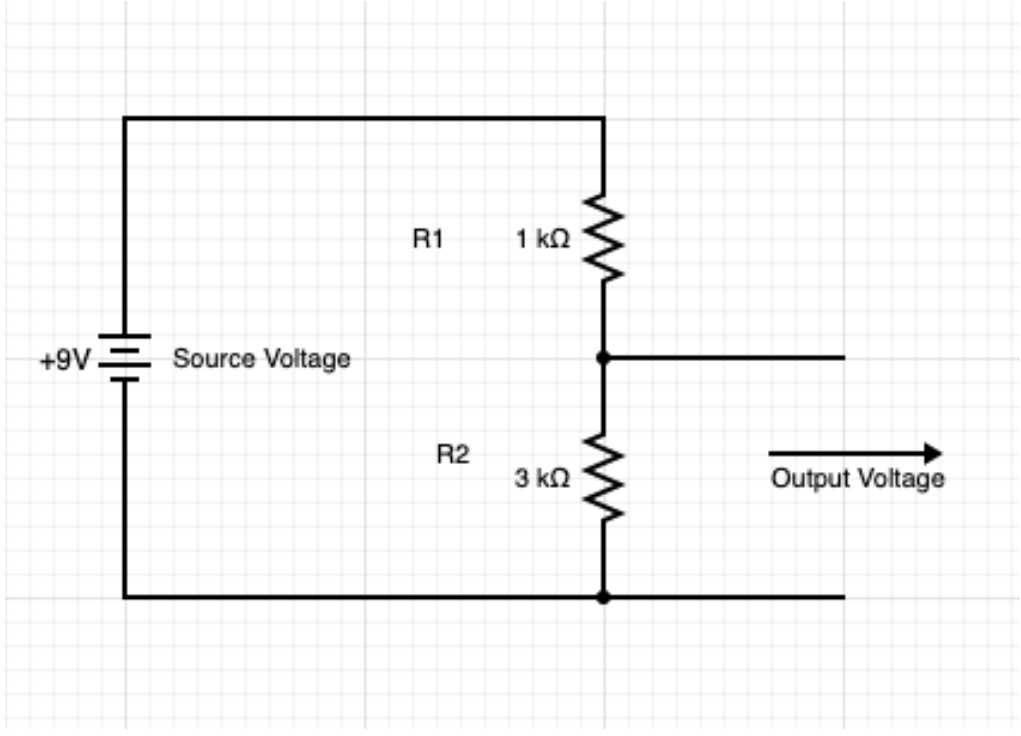
$I = 12/3 = 4$

$W = 12 * 4 = 48$

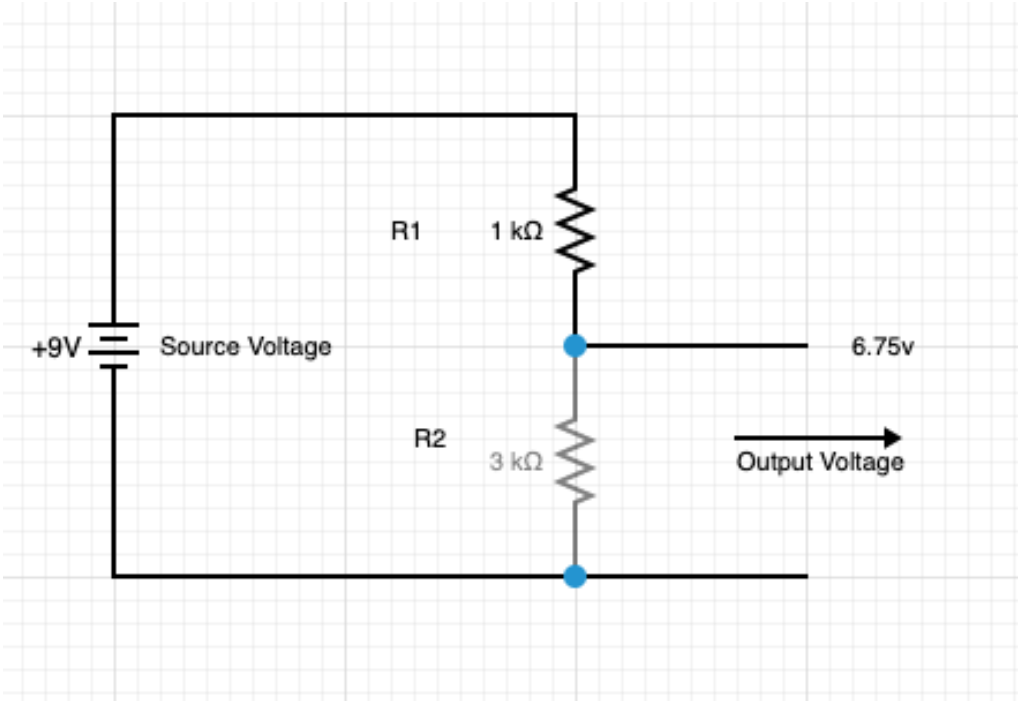
Power Dissipation = 48 Watts

Voltage Divider

- Used to step down the voltage
- Involves a pair of resistors

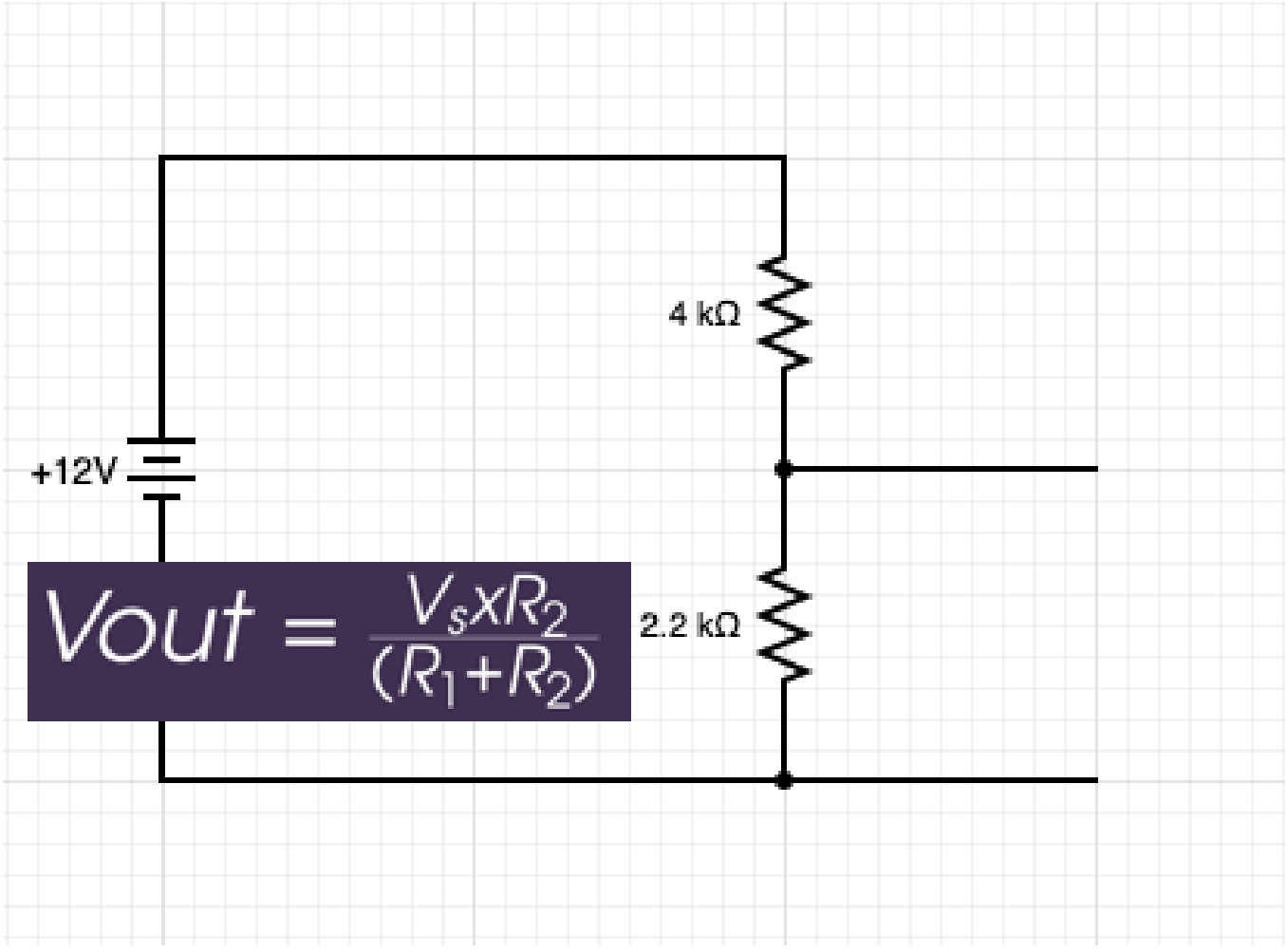


Voltage Divider Formula



$$Vout = \frac{V_s x R_2}{(R_1 + R_2)}$$

Voltage Divider Example 1



Voltage Divider Example 1 - Answer

$$Vout = \frac{V_s x R_2}{(R_1 + R_2)}$$

$$12v * 2200ohms = 26400$$

$$4000 + 2200 = 6200$$

$$26400/6200 = 4.26volts$$

Reading Data Sheets

(Andy - Do you have anything for this?)