Electric Circuits

MODULE 3

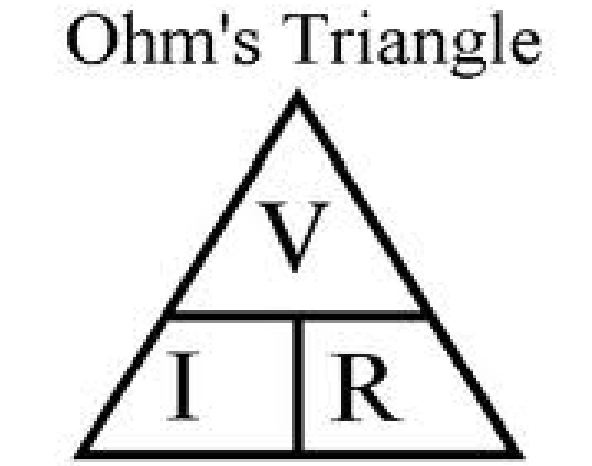
What's inside those wires?

Concept	Symbol	Unit	Definition
Current	*i*	Amps (A)	The measure of electron flow in a circuit
Voltage	V	Volts (V)	Difference in electrical potential used to drive electrons around a circuit
Resistance	R	Ohms (Ω)	The measure of how difficult it is for electrons to flow through a circuit

Ohm's Law

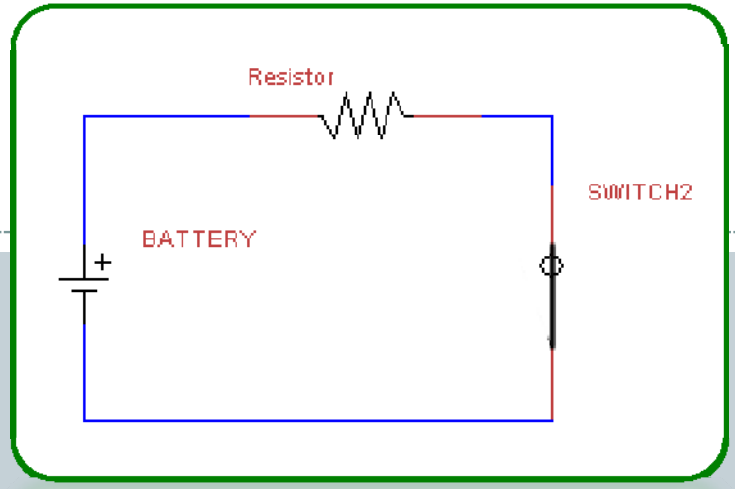
$$V = i \times R$$

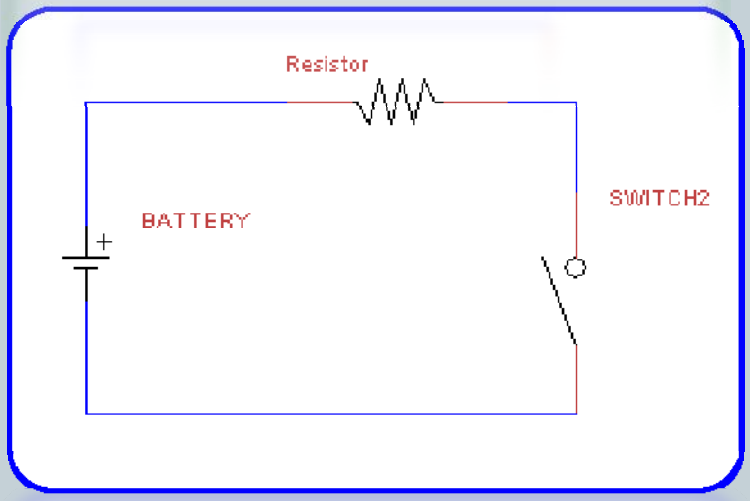
This formula relates these three important electrical quantities.



Making electrons flow

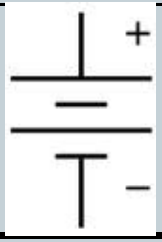
- Current only flows if it has a continuous path to a lower voltage.
  - The top picture shows a closed path (current will flow).
  - The bottom picture shows an open path (current will not flow).



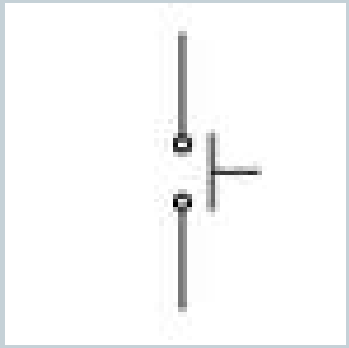
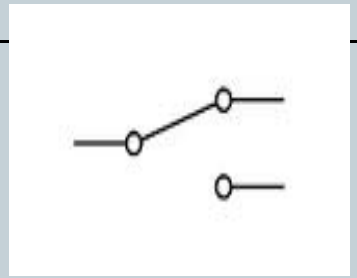


Learning to read circuits

- Symbols are used to represent different components in a circuit. Once you recognize the symbols you can read the circuit.

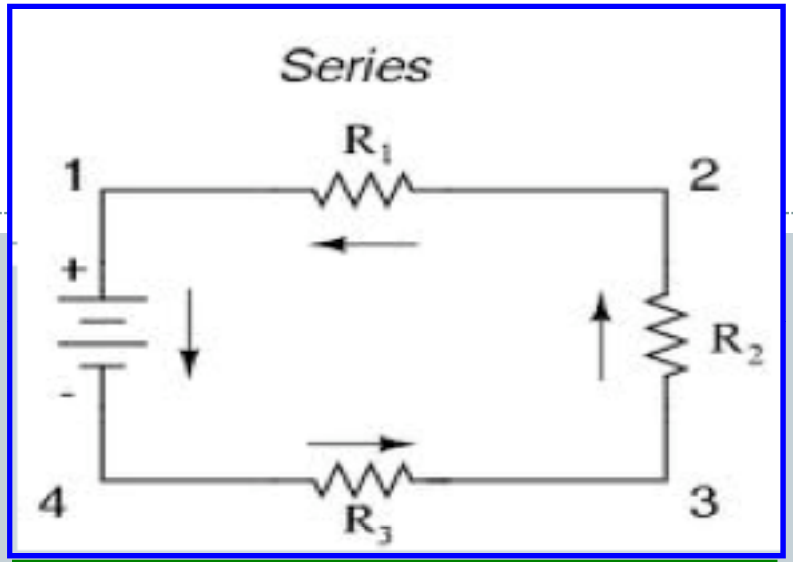
Wire		Wires connect the other components and create continuous path for the current.
Resistor		Resistors have a fixed resistance and can change the value of the current according to Ohm's Law.
Battery		Supplies a portable power supply.

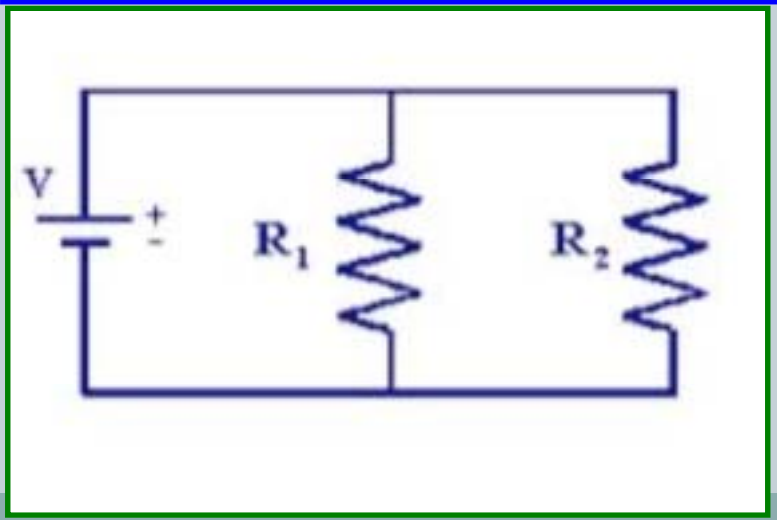
More Symbols

Button		Buttons are used to either (a) open/close a circuit to flow or (b) switch between two different circuits. Note that there is a normal position (either up or down) that the button will return to with no user input.
Switch		Similar to a button, but there is no normal state, the switch stays where the user puts it.

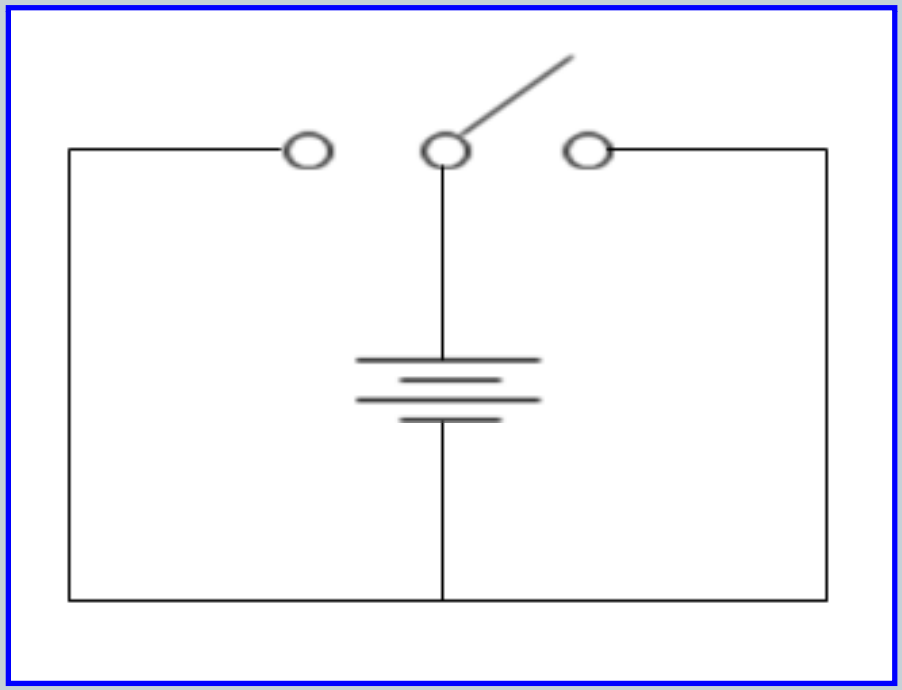
Different Paths to Follow

- Series circuits have a single path the current can follow. The current is the same everywhere in the circuit.
- Parallel circuits have more than one path so the current splits apart to pass through the different paths.

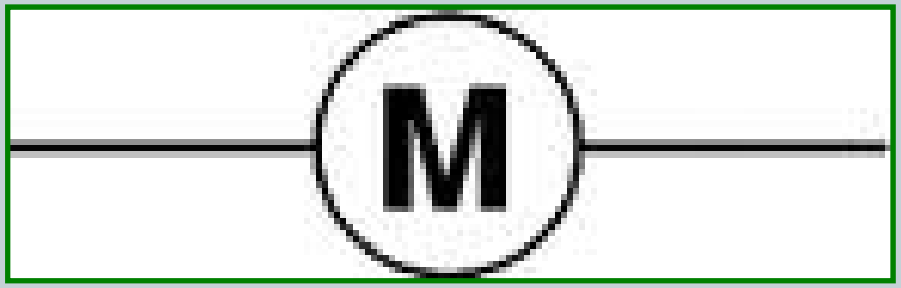




What does this circuit represent?



Motors in a circuit



- What determines the direction the motor spins?
  - Spin depends on the direction of the current
  - Spin also depends on how the battery terminals are connected

Motor Speed

- Related to current applied to the motor
  - More Current = More Force = Faster Speed
  - How do you vary the current?
    - Ohm's law relationship between voltage, current and resistance
    - Use variable voltage source
    - Change resistance of motor

Circuits in the Sea Perch

- Can you design, test, and build circuits to control the speed and direction of each of your motors?
- Brainstorm with your group and draw circuit diagrams to represent your ideas.