

# Ohm's Law

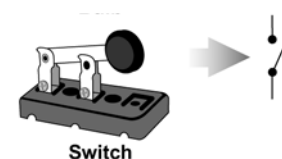
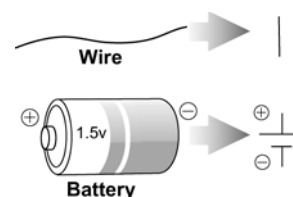
## READ

A German physicist, Georg S. Ohm, developed this mathematical relationship, which is present in most circuits. This relationship is known as Ohm's law. This relationship states that if the voltage (energy) in a circuit increases, so does the current (flow of charges). If the resistance increases, the current flow decreases.

$$\text{Current (amps)} = \frac{\text{Voltage (volts)}}{\text{Resistance (ohms, } \Omega)}$$

To work through this skill sheet, you will need the symbols used to depict circuits in diagrams. The symbols that are most commonly used for circuit diagrams are provided to the right.

If a circuit contains more than one battery, the total voltage is the sum of the individual voltages. A circuit containing two 6 V batteries has a total voltage of 12 V. [Note: The batteries must be connected positive to negative for the voltages to add.]



## EXAMPLE

If a toaster produces 12 ohms of resistance in a 120-volt circuit, what is the amount of current in the circuit?

<p><b>Given</b></p> <p>The resistance (<math>R</math>) is 12 ohms. The voltage (<math>V</math>) is 120 volts.</p>	<p><b>Solution</b></p> $I = \frac{V}{R} = \frac{120 \text{ volts}}{12 \text{ ohms}} = 10 \text{ amps}$ <p>The current in the toaster circuit is 10 amps.</p>
<p><b>Looking for</b></p> <p>The amount of current (<math>I</math>) in the circuit.</p>	
<p><b>Relationships</b></p> $I = \frac{V}{R}$	

If a problem asks you to calculate the voltage or resistance, you must rearrange the equation  $I=V/R$  to solve for  $V$  or  $R$ . All three forms of the equation are listed below.

$$I = \frac{V}{R} \quad V = IR \quad R = \frac{V}{I}$$

## PRACTICE

In this section, you will find some problems based on diagrams and others without diagrams. In all cases, show your work.

- How much current is in a circuit that includes a 9-volt battery and a bulb with a resistance of 3 ohms?
- How much current is in a circuit that includes a 9-volt battery and a bulb with a resistance of 12 ohms?
- A circuit contains a 1.5 volt battery and a bulb with a resistance of 3 ohms. Calculate the current.