NAME_____ CLASS _____ DATE _____

Algebra Essentials and Applications Internet Activity

ME1 Electricity Investigations

According to Ohm's Law, the amount of current flowing in a circuit is directly proportional to the electromotive force (EMF) placed on the circuit and inversely proportional to the total resistance of the circuit. In mathematical terms, I is the current measured in amperes (or amps), E is the EMF in volts, and R is the resistance in ohms; Ohm's Law is written as $I = \frac{E}{R}$.

The resistances may be configured either in series—one after the other like lights on a Christmas tree—or in parallel—all positive poles are connected to a single terminal or wire or junction, and all negative poles are similarly connected. The total resistance in a series circuit is found by simply adding the component resistances together. Thus, for two resistances R_1 and R_2 , the total resistance, R, is: $R = R_1 + R_2$. The total resistance in a parallel circuit is found by taking the reciprocal of the sum of the reciprocals of the component circuits: $R = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$. Therefore, Ohm's Law takes the following forms:

Series Circuit:	Parallel Circuit:
$I = \frac{E}{R}$	$I = \frac{E}{R}$
$I = \frac{E}{R_1 + R_2}$	$I = \frac{E}{\frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}}$
	$I = \frac{E}{\frac{1}{\frac{R_1 + R_2}{R_1 R_2}}}$
	$I = \frac{E(R_1 + R_2)}{R_1 R_2}$

1. What is the current, in amps, in a series circuit with a 9-volt battery and two resistances of 3 ohms each?

2. What is the current, in amps, in a parallel circuit with a 9-volt battery and two resistances of 3 ohms each?

Suppose that in a series circuit with a 9-volt battery, one of the resistances is 3 ohms and the second resistance varies. Then we have $I = \frac{E}{R} = \frac{9}{3 + R_2}$, and we can view the current as a function of the second resistance: $I(R_2) = \frac{9}{3 + R_2}$.

3. Complete the table below.

R_2 (in ohms):	0	3	6	9	12	15
$I(R_2) = \frac{9}{3 + R_2}$ (in amps):	3					

4. What happens to the current as the value of R_2 increases?

Suppose that in a parallel circuit with a 9-volt battery, one of the resistances is 3 ohms and the second resistance varies. Then we have

$$I = \frac{E(R_1 + R_2)}{R_1 \cdot R_2} = \frac{9(3 + R_2)}{3 \cdot R_2} = \frac{3(3 + R_2)}{R_2}$$

and we can again view the current as a function of the second resistance:

$$I(R_2) = \frac{3(3 + R_2)}{R_2}$$

5. Complete the table below.

R_2 (in ohms):	0	3	6	9	12	15
$I(R_2) = \frac{3(3 + R_2)}{R_2}$ (in amps):	undef.					

6. What happens to the current as the value of R_2 increases?
