Chapter 35   Electric Circuits

Ohm's Law and Parallel Circuits

The equivalent resistance for resistors in parallel can be found using the following equation.

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots + \frac{1}{R_n}$$

Calculate the current in a 48-V battery that powers three 15-Ω resistors connected in parallel.

1. Read and Understand

What information are you given?

voltage = V = 48 V

individual resistances: $R_1 = R_2 = R_3 = 15\ \Omega$

2. Plan and Solve

What unknown are you trying to calculate?

current = I = ?

What equation can you use to find the unknown?

Ohm's law: $V = IR$

For a parallel circuit, $V = IR_{eq}$, where R_{eq} is the equivalent resistance.

Rearranging the equation gives you $I = \dfrac{V}{R_{eq}}$.

First, find the equivalent resistance R_{eq}.

$$\frac{1}{R_{eq}} = \frac{1}{15\ \Omega} + \frac{1}{15\ \Omega} + \frac{1}{15\ \Omega} = \frac{1}{5\ \Omega}$$

$R_{eq} = 5\ \Omega$

Then substitute for V and R_{eq} to solve for I.

$$I = \frac{48\ \text{V}}{5\ \Omega} = 9.6\ \text{A}$$

3. Look Back and Check

Is your answer reasonable?

Yes, a current of 9.6 A is reasonable, and the units are $\dfrac{\text{V}}{\Omega}$, or A, which is reasonable.

Math Practice

On a separate sheet of paper, solve the following problems.

1. Calculate the current in a 9-V battery that powers three 6-Ω resistors in parallel.

Chapter 35   Electric Circuits

2. Calculate the voltage impressed across a circuit in which three 1.5-Ω resistors in parallel draw a current of 12 A.

3. Calculate the current in 12-V battery that powers four 10-Ω resistors in parallel.