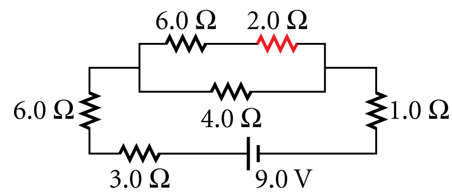
SAMPLE PROBLEM D

STRATEGY Current in and Potential Difference Across a Resistor

PROBLEM

Determine the current in and potential difference across the 2.0 Ω resistor highlighted in the figure below.



REASONING

First determine the total circuit current by reducing the resistors to a single equivalent resistance. Then rebuild the circuit in steps, calculating the current and potential difference for the equivalent resistance of each group until the current in and potential difference across the 2.0 Ω resistor are known.

SOLUTION

1. Determine the equivalent resistance of the circuit.

The equivalent resistance of the circuit is 12.7 Ω; this value is calculated in Sample Problem C.

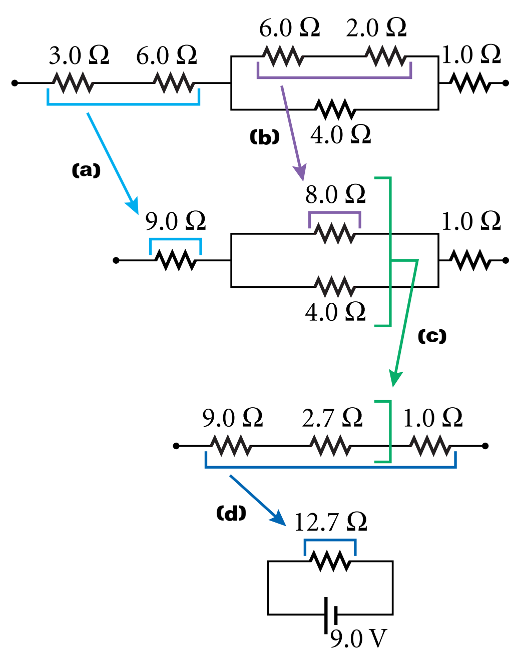
2. Calculate the total current in the circuit.

Substitute the potential difference and equivalent resistance in $\Delta V = IR$, and rearrange the equation to find the current delivered by the battery.

$$I = \frac{\Delta V}{R_{eq}} = \frac{9.0\ \text{V}}{12.7\ \Omega} = 0.71\ \text{A}$$

3. Determine a path from the equivalent resistance found in step 1 to the 2.0 Ω resistor.

Review the path taken to find the equivalent resistance in the figure at right, and work backward through this path. The equivalent resistance for the entire circuit is the same as the equivalent resistance for group **(d).** The center resistor in group **(d)** in turn is the equivalent resistance for group **(c).** The top resistor in group **(c)** is the equivalent resistance for group **(b),** and the right resistor in group **(b)** is the 2.0 Ω resistor.



TIP *It is not necessary to solve for R_{eq} first and then work backward to find current in or potential difference across a particular resistor, as shown in this Sample Problem, but working through these steps keeps the mathematical operations at each step simpler.*