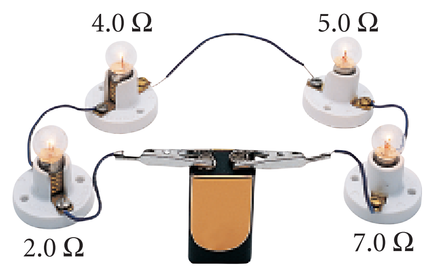
Because the current in each bulb is equal to the total current, you can also use $\Delta V = IR$ to calculate the potential difference across each resistor.

$$\Delta V_1 = IR_1 \quad \text{and} \quad \Delta V_2 = IR_2$$

The method described above can be used to find the potential difference across resistors in a series circuit containing any number of resistors.

SAMPLE PROBLEM A

Resistors in Series



PROBLEM

A 9.0 V battery is connected to four light bulbs, as shown at right. Find the equivalent resistance for the circuit and the current in the circuit.

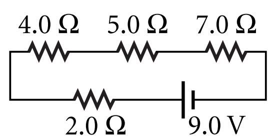
SOLUTION

1. DEFINE

Given: $\Delta V = 9.0$ V $R_1 = 2.0\ \Omega$ $R_2 = 4.0\ \Omega$ $R_3 = 5.0\ \Omega$ $R_4 = 7.0\ \Omega$

Unknown: $R_{eq} = ?$ $I = ?$

Diagram:



2. PLAN

Choose an equation or situation:
Because the resistors are connected end to end, they are in series. Thus, the equivalent resistance can be calculated with the equation for resistors in series.

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

The following equation can be used to calculate the current.

$$\Delta V = IR_{eq}$$

Rearrange the equation to isolate the unknown:
No rearrangement is necessary to calculate R_{eq}, but $\Delta V = IR_{eq}$ must be rearranged to calculate current.

$$I = \frac{\Delta V}{R_{eq}}$$

3. CALCULATE

Substitute the values into the equation and solve:

$$R_{eq} = 2.0\ \Omega + 4.0\ \Omega + 5.0\ \Omega + 7.0\ \Omega$$

$$\boxed{R_{eq} = 18.0\ \Omega}$$

continued on next page