3. CALCULATE **Substitute the values into the equation and solve:**

$$\text{emf} = -(25)(1.8\ \cancel{\text{m}^2})(\cos 0.0°)\ \frac{\left((0.55 - 0.00)\ \dfrac{\text{V}\cdot\cancel{\text{s}}}{\cancel{\text{m}^2}}\right)}{(0.85\ \cancel{\text{s}})} = -29\ \text{V}$$

$$I = \frac{-29\ \text{V}}{2.5\ \Omega} = -12\ \text{A}$$

$$\boxed{\begin{aligned}\text{emf} &= -29\ \text{V}\\ I &= -12\ \text{A}\end{aligned}}$$

TIP *Because the minimum number of significant figures for the data is two, the calculator answer, 29.11764706, should be rounded to two digits.*

4. EVALUATE The induced emf, and therefore the induced current, is directed through the coil so that the magnetic field produced by the induced current opposes the change in the applied magnetic field. For the diagram shown on the previous page, the induced magnetic field is directed to the right and the current that produces it is directed from left to right through the resistor.

PRACTICE A

Induced emf and Current

1. A single circular loop with a radius of 22 cm is placed in a uniform external magnetic field with a strength of 0.50 T so that the plane of the coil is perpendicular to the field. The coil is pulled steadily out of the field in 0.25 s. Find the average induced emf during this interval.
2. A coil with 205 turns of wire, a total resistance of 23 Ω, and a cross-sectional area of 0.25 m^2 is positioned with its plane perpendicular to the field of a powerful electromagnet. What average current is induced in the coil during the 0.25 s that the magnetic field drops from 1.6 T to 0.0 T?
3. A circular wire loop with a radius of 0.33 m is located in an external magnetic field of strength +0.35 T that is perpendicular to the plane of the loop. The field strength changes to −0.25 T in 1.5 s. (The plus and minus signs for a magnetic field refer to opposite directions through the coil.) Find the magnitude of the average induced emf during this interval.
4. A 505-turn circular-loop coil with a diameter of 15.5 cm is initially aligned so that its plane is perpendicular to Earth's magnetic field. In 2.77 ms the coil is rotated 90.0° so that its plane is parallel to Earth's magnetic field. If an average emf of 0.166 V is induced in the coil, what is the value of Earth's magnetic field?