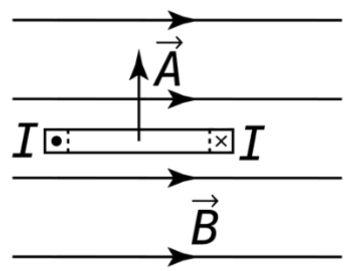
Flipping Physics Lecture Notes:
Magnetic Flux
http://www.flippingphysics.com/magnetic-flux.html

Before we learn about electromagnetic induction, we need to learn about magnetic flux. Before we do that, let's review electric flux:

- Electric flux is the measure of the number of electric field lines which pass through a surface.
- When the electric field is uniform, and the surface is a two-dimensional plane:
  $\Phi_E = \vec{E} \cdot \vec{A} = EA\cos\theta$
- The general equation for electric flux: $\Phi_E = \int \vec{E} \cdot d\vec{A}$

Magnetic flux:



- Magnetic flux is the measure of the number of magnetic field lines which pass through a surface.
- When the magnetic field is uniform, and the surface is a two-dimensional plane: $\Phi_B = \vec{B} \cdot \vec{A} = BA\cos\theta$
- The general equation for magnetic flux:
  $\Phi_B = \int \vec{B} \cdot d\vec{A} \Rightarrow T \cdot m^2 = \text{webbers, } Wb$
- Example #1: Current through a wire loop. Use the right-hand rule to determine the direction of the area vector. (Similar to the right-hand rule for angular velocity direction.) Fingers curl in the direction of the current, thumb points in the direction of the area vector.
  $\Phi_B = BA\cos\theta = BA\cos 90^\circ = 0$
- Example #2: $\Phi_B = BA\cos\theta = BA\cos 0^\circ = \Phi_{B_{max}}$