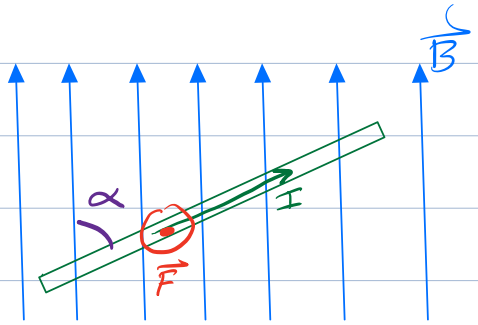
Suppose there is a uniform $\vec{B}$ produced by some other currents or magnets not shown. What force is exerted on a current-carrying wire?



wire has length L
carries current I

$$\vec{F} = I\vec{L} \times \vec{B}$$

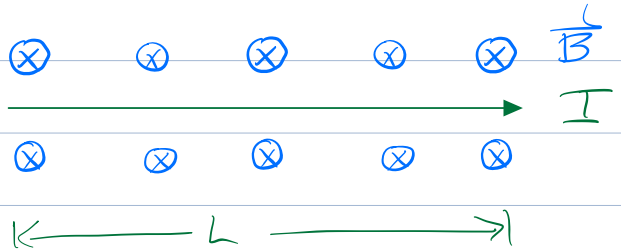
Magnitude: $|\vec{F}| = ILB\sin\alpha$

Direction: right hand rule for $I\vec{L} \times \vec{B}$:

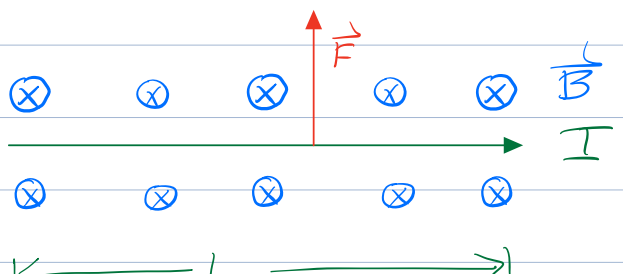
- Fingers in the direction of the current
- Curl fingers to point along $\vec{B}$
- Thumb points in the direction of $\vec{F}$

$\vec{F}$ is out of the page here.

Example: current in a uniform field:



What is the direction of $\vec{F}$?



$\vec{F} = I \vec{L} \times \vec{B}$.

Example: $B = 0.1\ T$, $L = 0.20\ m$, $I = 15\ A$

For the geometry above

$F = I L B \sin 90^\circ$

$= (15\ A)(0.20\ m)(0.1\ T) = 0.3\ N$

Examples:

1. Ch24-parallel-wires
2. Forces between parallel wires
3. Current Balance

Key idea in these examples: One wire creates a magnetic field, the other wire responds to that magnetic field.