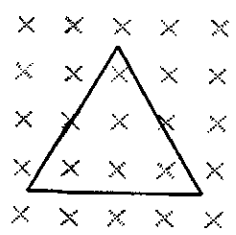
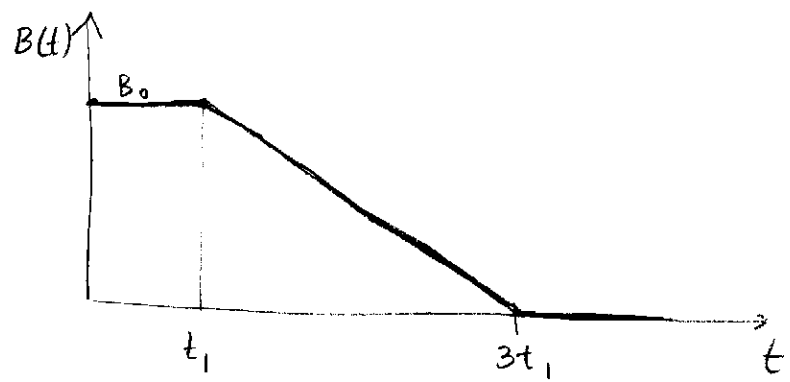


An equilateral triangle is constructed of three thin wires, each with length s and resistance R . The triangle sits inside a uniform magnetic field of strength B_0 , pointing into the page. At time t_1 , the magnetic field starts decreasing in strength at a steady rate, until it vanishes completely at time $3t_1$. After time $3t_1$, the magnetic field stays off.



What current flows around the triangle at time

- (a) $.5t_1$?
- (b) $2t_1$?
- (c) $4t_1$?
- (d) When current flows, does it flow clockwise or counterclockwise? Explain your reasoning.



a)

$$\mathcal{E}_{ind} = - \frac{d\Phi_B}{dt}$$

At $t = 0.5t_1$, the field is not changing,

$$\text{so } \frac{d\Phi_B}{dt} = 0 \Rightarrow \boxed{I_{ind} = 0}$$

b)

During the time it's decreasing,

$$B(t) = B_0 - (\text{slope})(t)$$

$\frac{d\Phi_B}{dt}$ is the slope

$$\frac{d(B \cdot A)}{dt} = \frac{0 - B_0 A}{3t_1 - t_1} = - \frac{B_0 \cdot A}{2t_1}$$

$$\text{So } |\mathcal{E}_{ind}| = \left(\frac{B_0 A}{2t_1} \right)$$

$$I_{ind} = \mathcal{E}_{ind} / 3R$$

A is area,

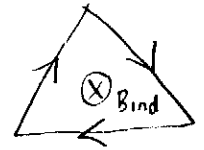
$$\begin{aligned} A &= \frac{1}{2}(\text{base})(\text{height}) \\ &= \frac{1}{2} s s \sin 60^\circ = \frac{1}{2} s^2 \frac{\sqrt{3}}{2} \\ &= \frac{s^2 \sqrt{3}}{4} \end{aligned}$$

$$\Rightarrow I_{ind} = \frac{B_0 s^2 \sqrt{3}}{2 t_1} \frac{1}{43R} = \frac{B_0 s^2 \sqrt{3}}{24 t_1 R}$$

c) Again, flux is not changing,
 so $I_{ind} = 0$

d) Lenz's Law: current produces flux to oppose change. Flux is decreasing into the page. So I_{ind} wants to increase it into the page

I_{ind} is CW.



"The triangle hates change"