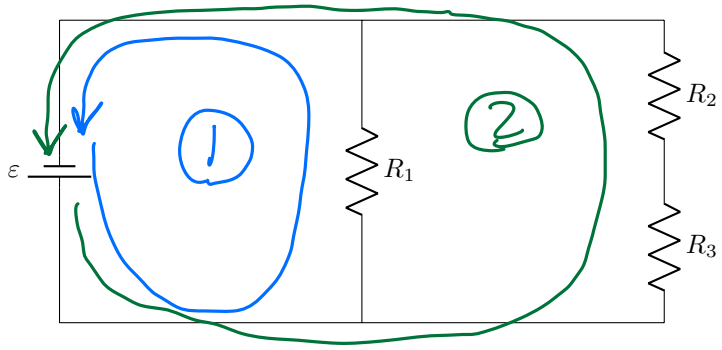
Quiz 7

The following information may or may not be of use:

$$\text{Ohm's Law: } I = \frac{\Delta V}{R}$$
$$\text{Electrical Resistance: } R = \frac{L}{\sigma A}$$
$$\text{Power: } P = I\Delta V$$

In the following diagram: $R_1 = 100\ \Omega$, $R_2 = 100\ \Omega$, and $R_3 = 220\ \Omega$. The battery emf $\varepsilon = 3.0$ V.



1. Find the currents I_1, I_2, I_3 through each resistor
2. What is the power output of the battery?

Loop rule. 2 eqns.

(1) $\mathcal{E} - I_1 R_1 = 0$

(2) $\mathcal{E} - I_2 R_2 - I_3 R_3 = 0$

$I_2 = I_3$, since $R_2 + R_3$ are in series

Node Rule: $I_{batt} = I_1 + I_2$

(1) $\longrightarrow$ $I_1 = \dfrac{\mathcal{E}}{R_1} = \dfrac{3\ V}{100\ \Omega}$

$$\boxed{I_1 = 0.03\ A}$$

(2) $\longrightarrow$ $\mathcal{E} - I_2 R_2 - I_2 R_3 = 0$

$$I_2 = \frac{\mathcal{E}}{R_2 + R_3} = \frac{3\ V}{320\ \Omega}$$

$$I_2 = I_3 = 0.0094\ A$$

$$P_{batt} = I_{batt} \Delta V_{batt} = I_{batt} \mathcal{E}$$

$$I_{batt} = I_1 + I_2 = 0.039\ A$$

$$P_{batt} = (0.039\ A)(3\ V) = 0.118\ W$$