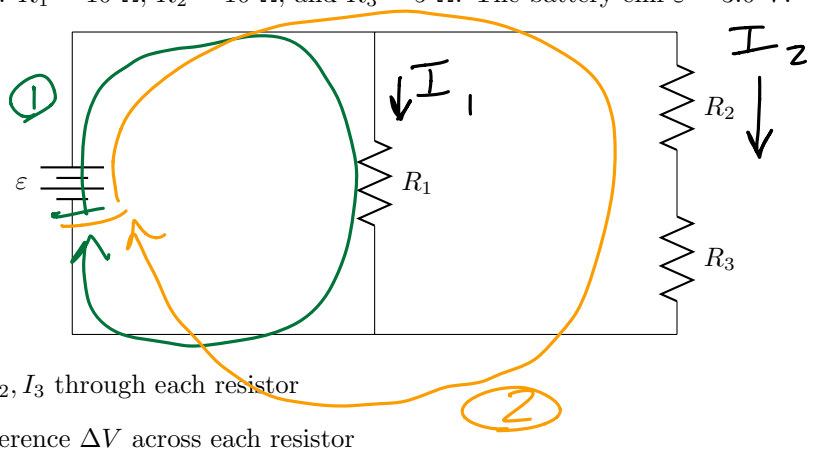
Quiz 6

In the following diagram: $R_1 = 10\ \Omega$, $R_2 = 10\ \Omega$, and $R_3 = 5\ \Omega$. The battery emf $\varepsilon = 3.0$ V.



1. Find the currents I_1, I_2, I_3 through each resistor
2. Find the potential difference ΔV across each resistor
3. Find the power dissipated through each resistor

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

$$I_1 = \frac{\mathcal{E}}{R_1} = \frac{3}{10}\ A$$

2 $\quad \mathcal{E} - I_2 R_2 - I_2 R_3 = 0$

$$I_2 = I_3 = \frac{\mathcal{E}}{R_2 + R_3} = \frac{3}{15} = \frac{1}{5}\ A$$

2 $\quad \Delta V_1 = I_1 R_1 = \left(\frac{3}{10}\right)(10) = 3\ V$

$$\Delta V_2 = I_2 R_2 = \left(\frac{1}{5}\right)(10) = 2\ V$$

$$\Delta V_3 = I_2 R_3 = \left(\frac{1}{5}\right)(5) = 1\ V$$

(3) $P = IV = I^2R$

$P_1 = I_1V_1 = \frac{3}{10}(3) = \boxed{\frac{9}{10}\,W}$

also:

$P_1 = I^2R_1 = \left(\frac{3}{10}\right)^2 10 = \boxed{\frac{9}{10}\,W}$ ✓

$P_2 = I_2\Delta V_2 = \left(\frac{1}{5}\right)(2) = \boxed{\frac{2}{5}\,W}$

$= I_2^2R_2 = \left(\frac{1}{5}\right)^2(10) = \frac{10}{25} = \boxed{\frac{2}{5}\,W}$ ✓

$P_3 = I_2\Delta V_3 = \frac{1}{5}(1) = \boxed{\frac{1}{5}\,W}$

$= I_2^2R_3 = \left(\frac{1}{5}\right)^2(5) = \boxed{\frac{1}{5}\,W}$