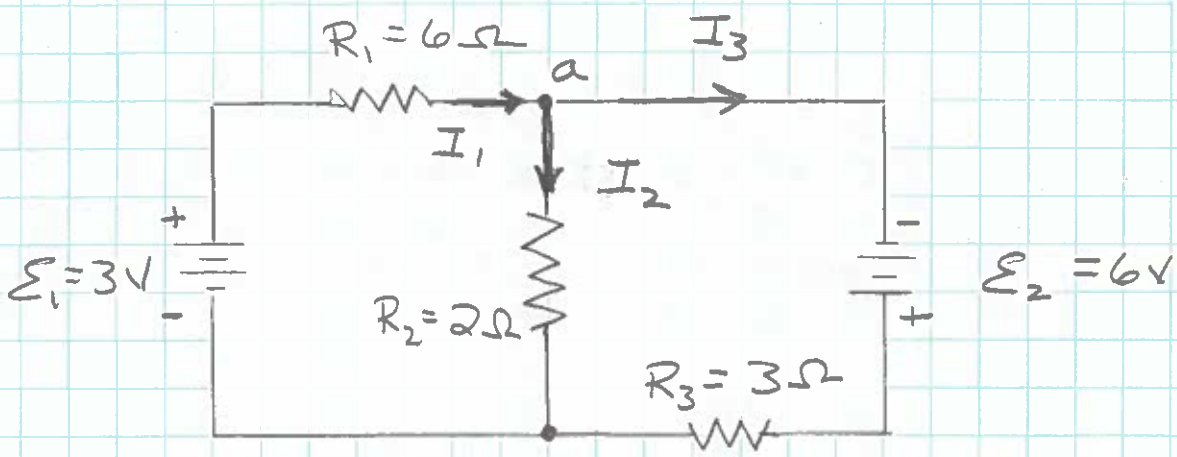

Currents in assumed direction.

Junction a: $I_1 = I_2 + I_3$ (1)

Left loop ↻ a: $-I_2R_2 + \mathcal{E}_1 - I_1R_1 = 0$ (2)

Right loop ↻ a: $\mathcal{E}_2 - I_3R_3 + I_2R_2 = 0$ (3)

Subst. eqn (1) → eqn (2)

$$-I_2R_2 + \mathcal{E}_1 - (I_2 + I_3)R_1 = 0$$

Or, $$-I_2(R_2 + R_1) + \mathcal{E}_1 - I_3R_1 = 0 \quad (4)$$

Eqn (3) and (4) with numbers:

(3) → $6 - 3I_3 + 2I_2 = 0$

(4) → $-8I_2 + 3 - 6I_3 = 0$

Or,

$$-3I_3 + 2I_2 = -6 \quad (5)$$

$$6I_3 + 8I_2 = 3 \quad (6)$$

Solve the two simultaneous equations.

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Take: $\frac{2 \times (\text{eqn}(5)) + \text{eqn}(6)}{2}$

$$= 0 I_3 + 12 I_2 = -9$$

So: $$I_2 = -\frac{9}{12} \text{ A} = -0.75 \text{ A}$$

and:

$$\text{eqn}(5) \rightarrow I_3 = \frac{2 I_2 + 6}{3}$$

$$= 1.5 \text{ A}$$

$$\text{eqn}(1) \quad I_1 = I_2 + I_3 = 0.75 \text{ A}$$

$\therefore$ power dissipated in R_2 is:

$$P_2 = I_2^2 R_2 = 1.125 \text{ W}$$

PhET Solution