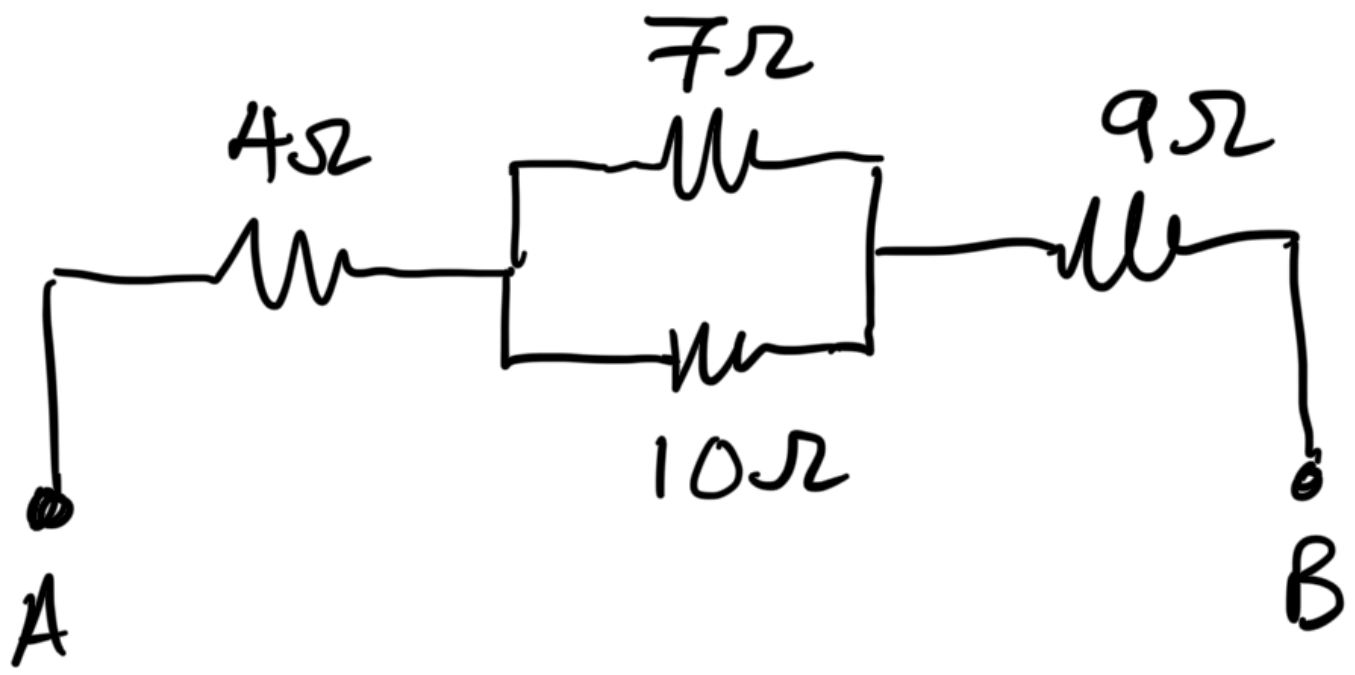
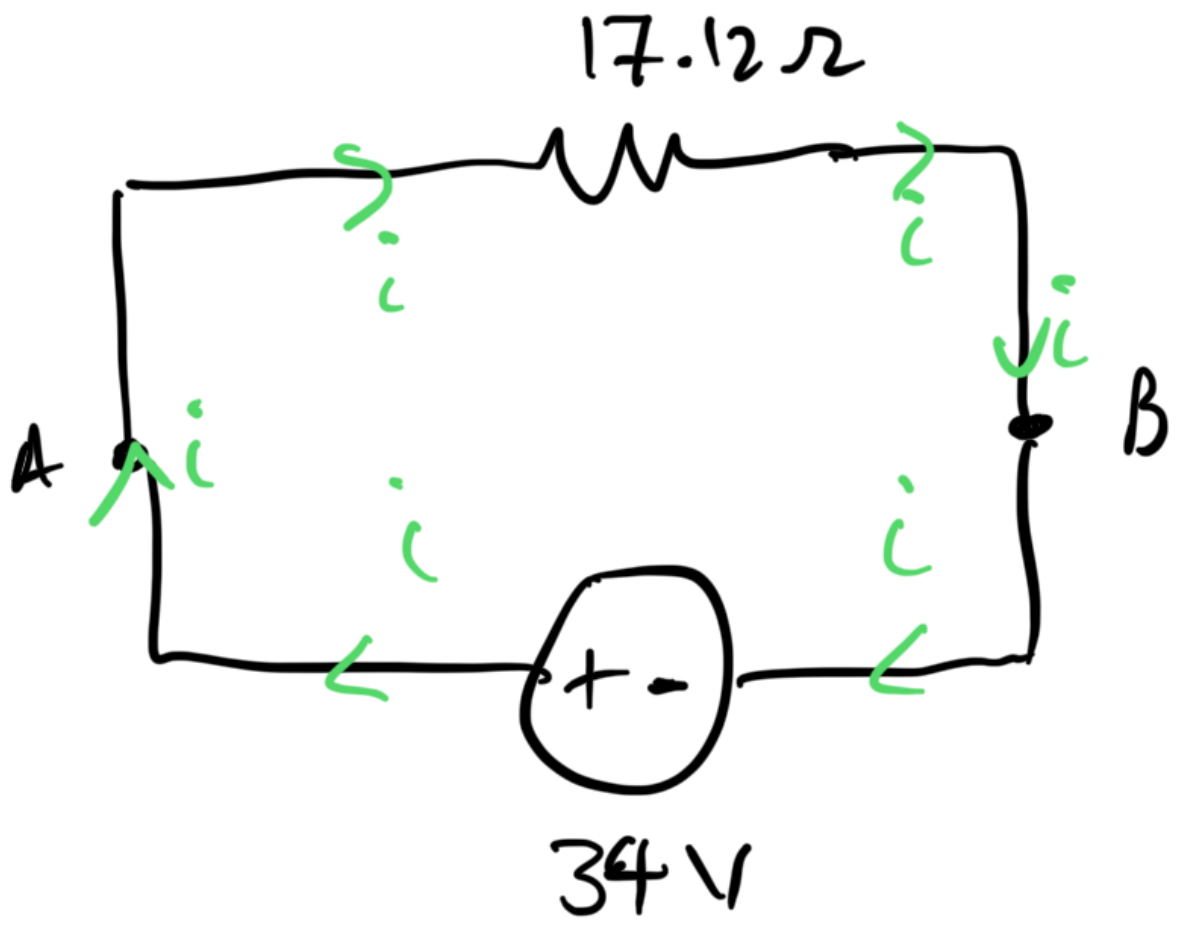
# Even More Circuits

7.




$$R_{eq} = 4 + 9 + \frac{1}{\frac{1}{7} + \frac{1}{10}}$$

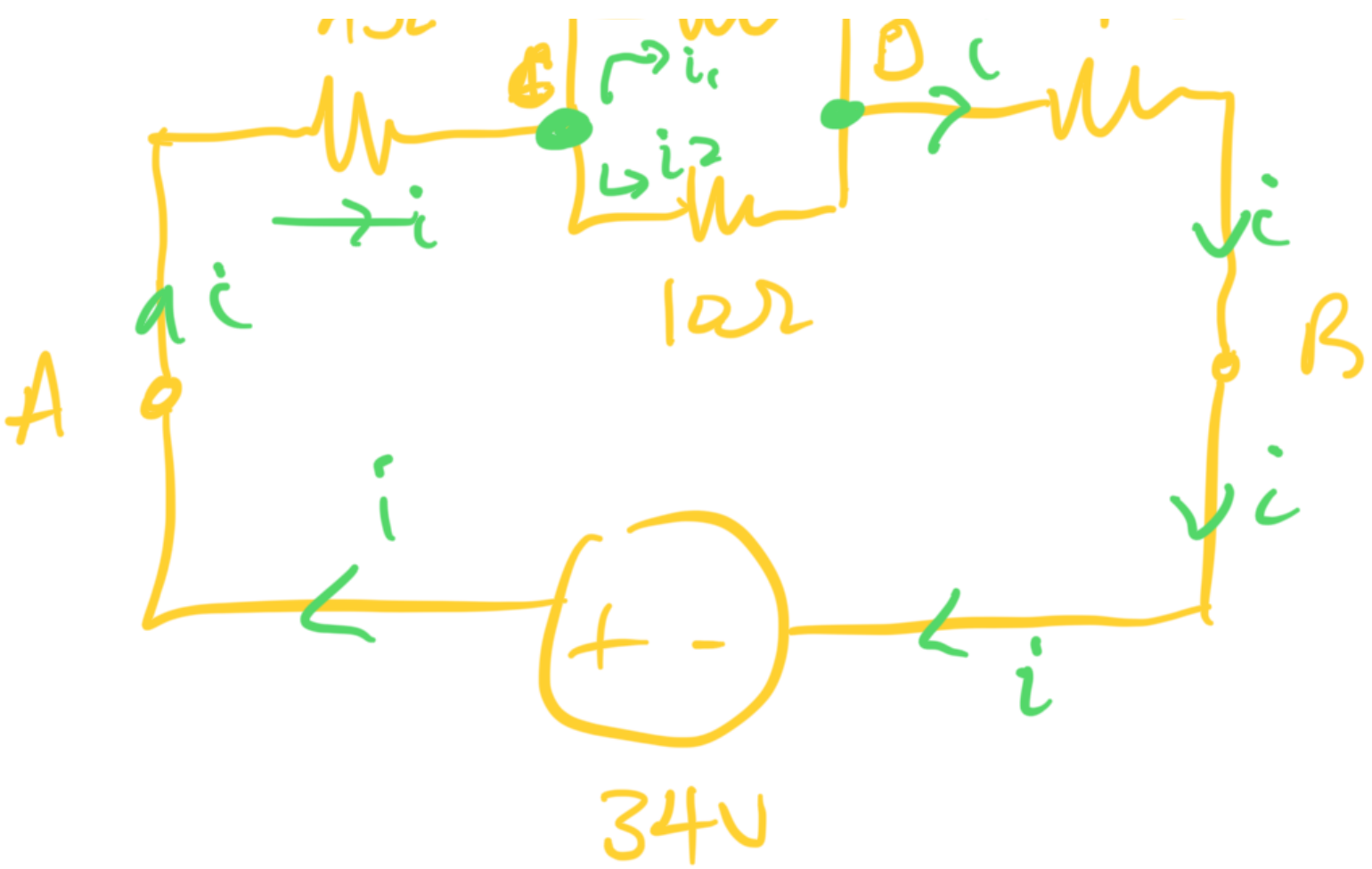
$$= 17.12\,\Omega$$




$$i = \frac{34\,V}{17.12\,\Omega} = 1.986\,A$$

7Ω

4Ω 9Ω




$\therefore \quad i_{4\Omega} = 1.986\ A$

$i_{9\Omega} = 1.986\ A$

What are $i_1, i_2$ ??

$\Delta V_{CD} = i_1(7) = i_2(10)$

$\therefore \quad i_1 = \frac{10}{7} i_2$

Also, $i = i_1 + i_2$

$= \frac{10}{7} i_2 + i_2$

$i = \left(\frac{10}{7} + 1\right) i_2$

$i_2 = \frac{i}{\quad} = 0.818\ A$

$$\left(\frac{10}{7}+1\right)$$

$$i_1 = i - i_2 = 1.168\ A$$

$$\therefore \quad i_{7\Omega} = 1.168\ A$$

$$i_{10\Omega} = 0.818\ A$$

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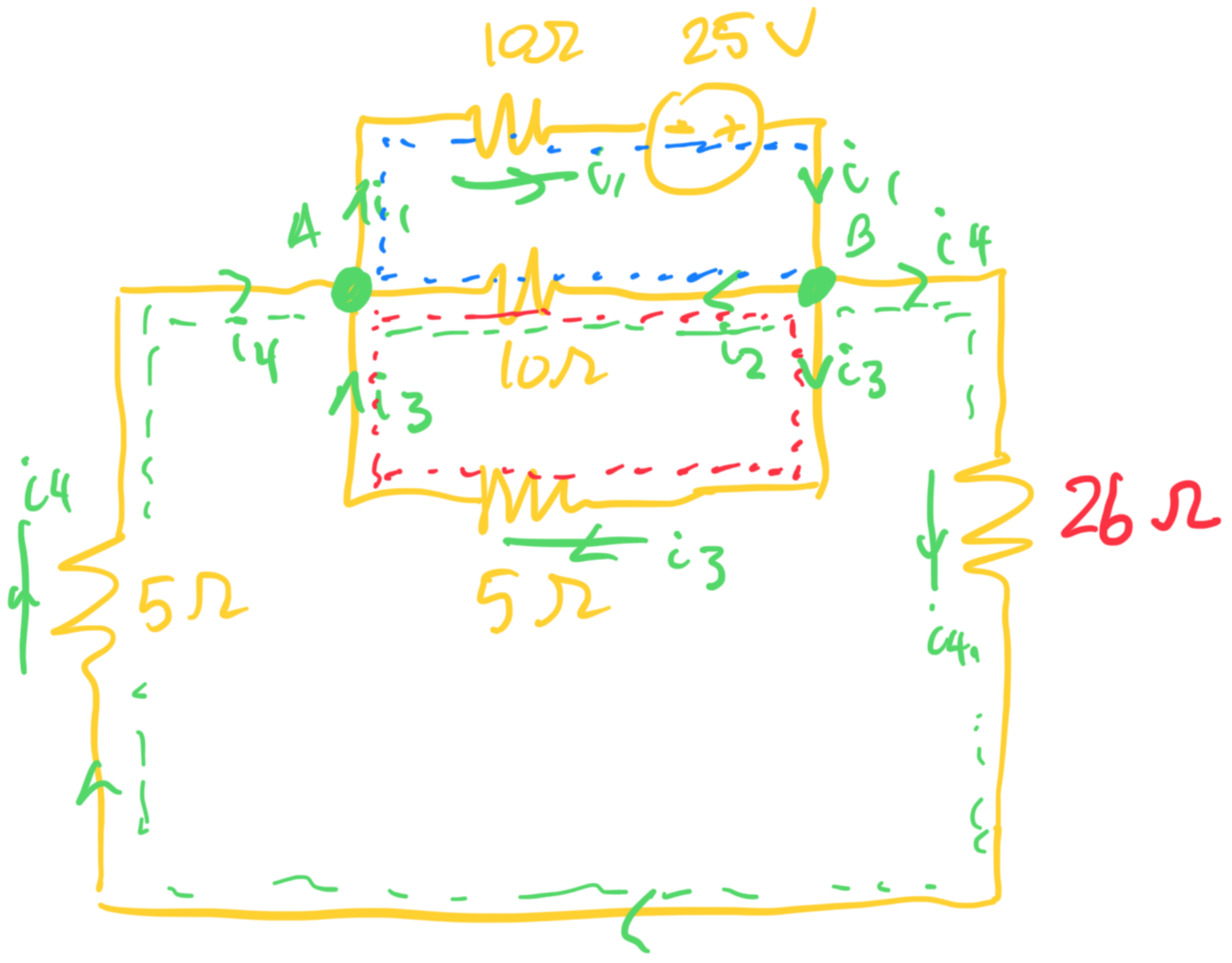
#8.




Junction.

$$i_1 = i_2 + i_3 + i_4 \qquad (1)$$

.... Loop 1 → $-5i_3 + 10i_2 = 0$ (2)

.... Loop 2 → $-10i_2 - 10i_1 + 25 = 0$ (3)

---Loop 3 → $-26i_4 - 5i_4 + 10i_2 = 0$ (4)

!!

Transform: $i_1 \to x$ $i_2 \to y$ $i_3 \to z$ $i_4 \to t$

(1) $x - y - z - t = 0$

(2) $10y - 5z = 0$

(3) $-8x - 10y = -25$

(4) $10y - 31t = 0$

!!

$i_1 = 1.92$ A

$i_2 = 0.58$ A

$i_3 = 1.16$ A

a) $\boxed{i_4 = 0.186 \text{ A}}$ ← Current through 26 Ω resistor

b) $\Delta V_A = 10\, i_2 = 5.8\ V$

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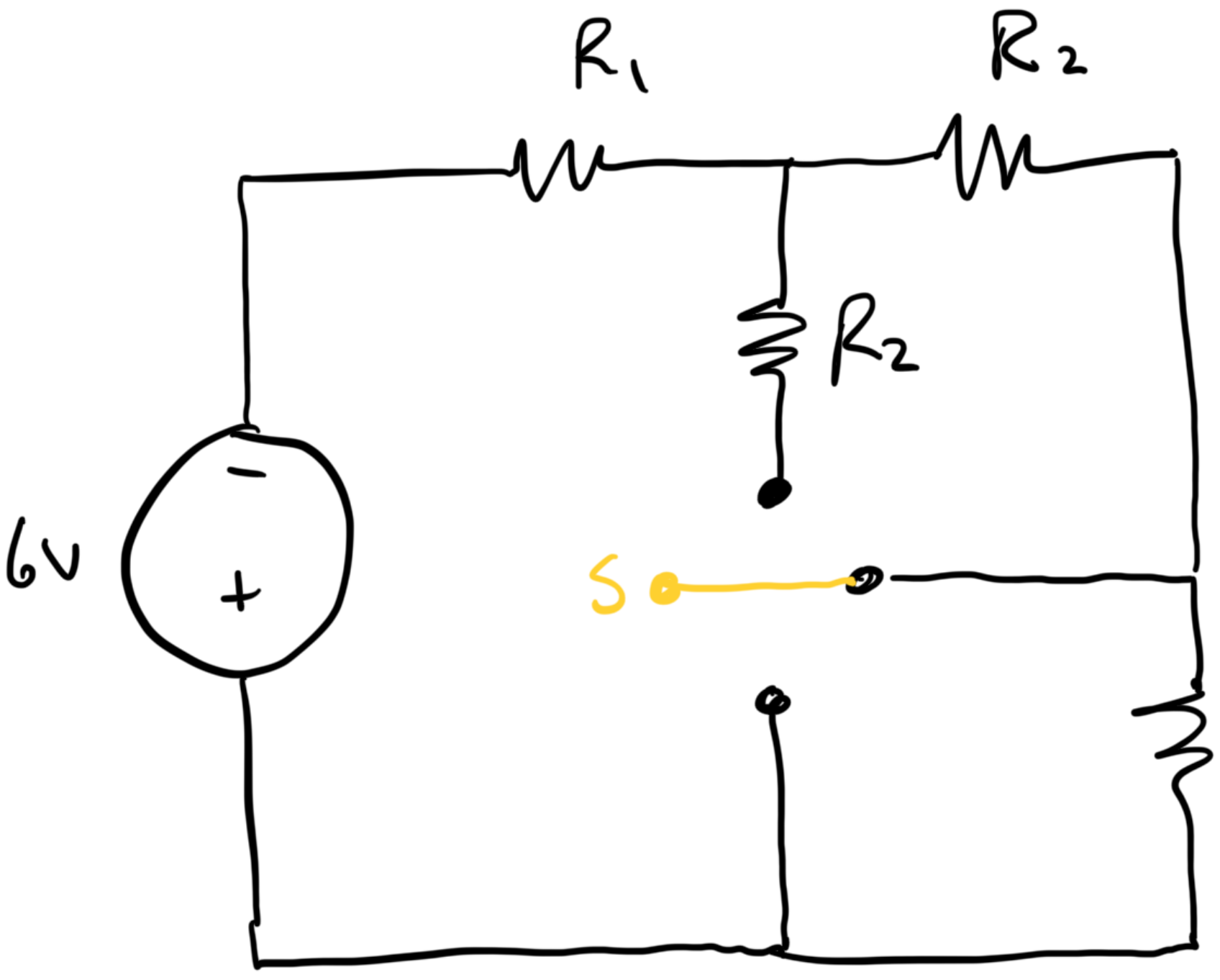
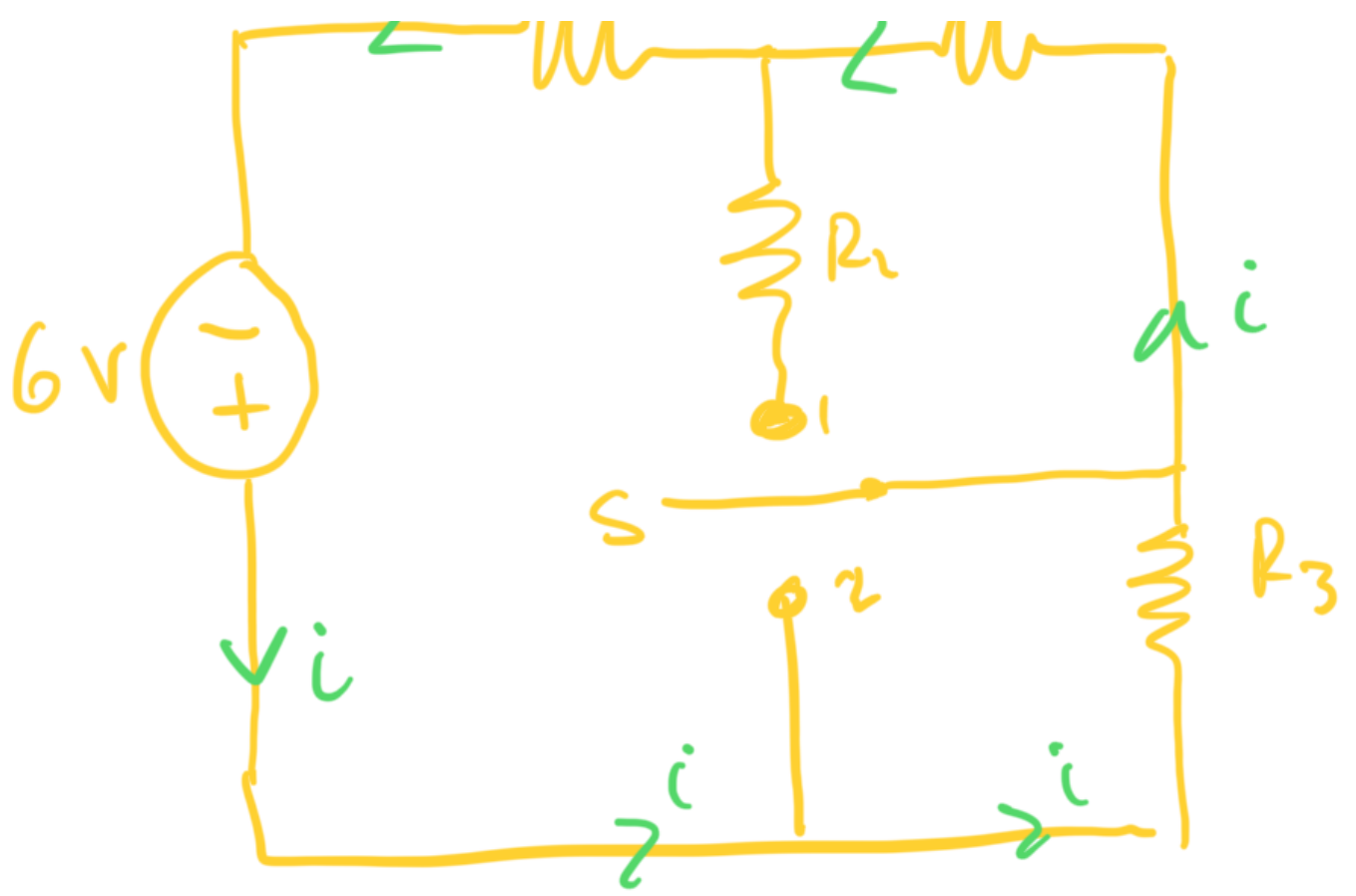
g. Wait ... we can't solve this one so easily with Falstad.com!!

This is a DESIGN problem!!




$i_{R_1}$ $i_{R_2}$

1.




$$6 - iR_3 - iR_2 - iR_1 = 0$$

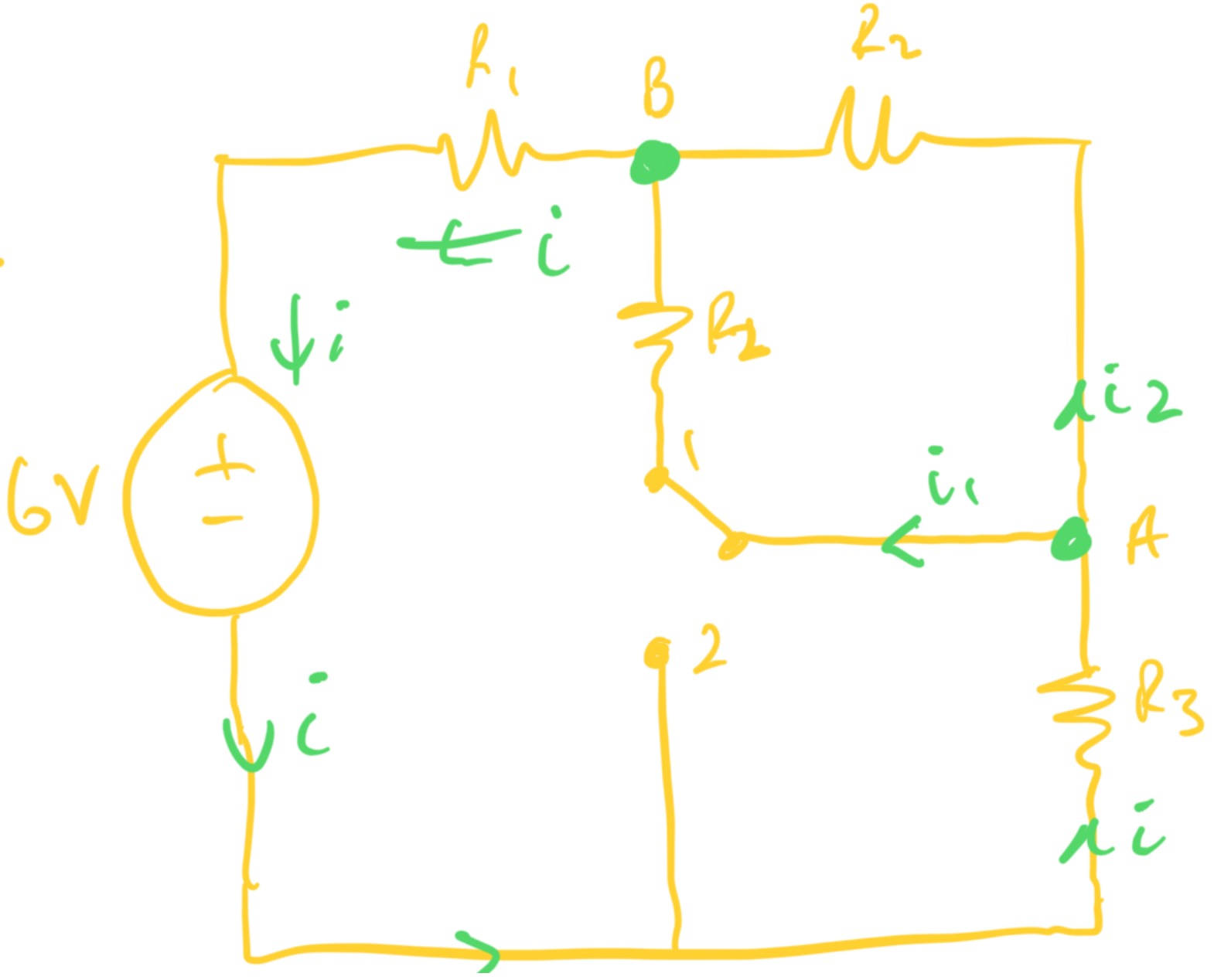
$$6 - i(R_3 + R_2 + R_1) = 0$$

$$R_3 + R_2 + R_1 = 6/i = 6/.001$$

$$= 6000$$

$$\boxed{R_3 + R_2 + R_1 = 6000}$$

2.



$i$

$$\Delta V_{AB} = i_2 R_2 = i_1 R_2$$

$$\therefore i_1 = i_2 = i/2$$

$$6 - i R_3 - \frac{i}{2} R_2 - i R_1 = 0$$

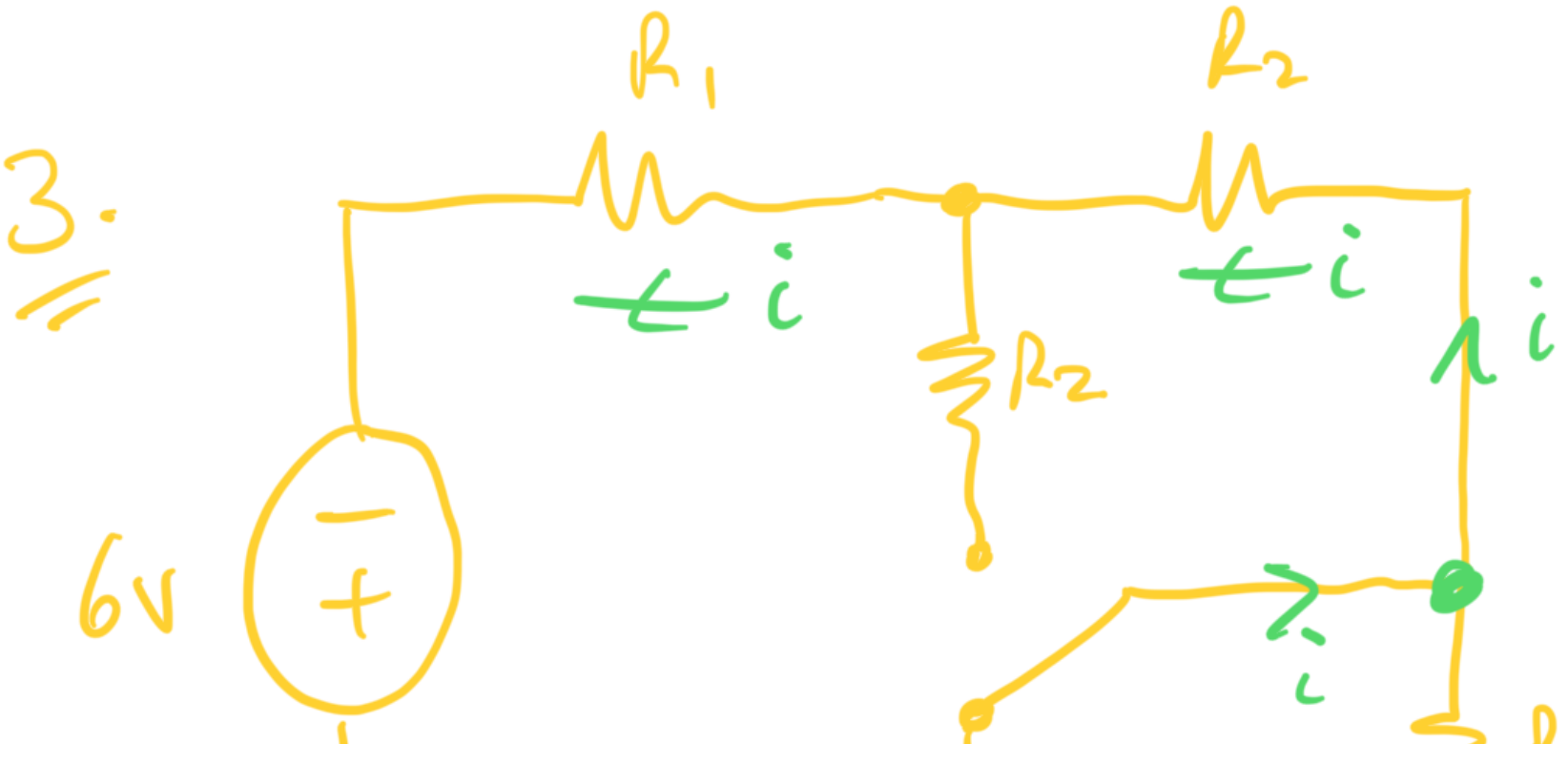
$$6 - i\left(R_3 + \frac{R_2}{2} + R_1\right) = 0$$

$$R_3 + \frac{R_2}{2} + R_1 = 6/i = \frac{6}{.00115}$$

$$= 5217.4$$

$$\boxed{R_3 + \frac{R_2}{2} + R_1 = 5217.4}$$

3.




$$6 - iR_2 - iR_1 = 0$$

$$R_2 + R_1 = 6/i = \frac{6}{.0019}$$

$$= 3157.89$$

$$R_2 + R_1 = 3157.89 \quad (3)$$

$$R_3 + R_2 + R_1 = 6000.00 \quad (1)$$

$$R_3 + \frac{R_2}{2} + R_1 = 5217.40 \quad (2)$$

$$(1) - (2) \rightarrow \frac{R_2}{2} = 6000 - 5217.40$$

$$R_2 = 1565.2\ \Omega$$

$$= \boxed{1.565\ k\Omega}$$

$$(3) \rightarrow 1565.2 + R_1 = 3157.89$$

$$R_1 = 1592.67\,\Omega$$

$$= \boxed{1.592\ k\Omega}$$

① $\rightarrow$ $R_3 + 1565.2 + 1592.67 = 6000$

$$R_3 = 2842.1\,\Omega$$

$$= \boxed{2.84\ k\Omega}$$

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Interesting Observation:

$$\Delta V = i R$$

↑ Volts ↑ Amps ↑ Ohms

$$V = A \cdot \Omega$$

$$= mA \cdot k\Omega$$

So, sometimes, if we use current in $mA$ and resistance in $k\Omega$

it will work out nicely !!

We could have done that in this problem, in fact.