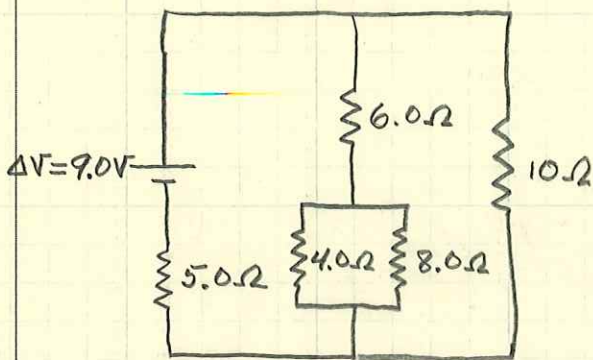


Analyzing a circuit, example

Resistors

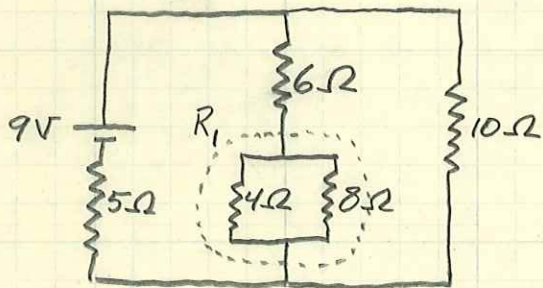


- I through battery
- Find - ΔV across each R
- I through each R

- Know - Values for all R's
- ΔV_{batt}
- series $\rightarrow R_{eq} = R_1 + R_2$
- parallel $\rightarrow R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$
- Ohm's Law
 $\Delta V = IR$ or $I = \frac{\Delta V}{R}$

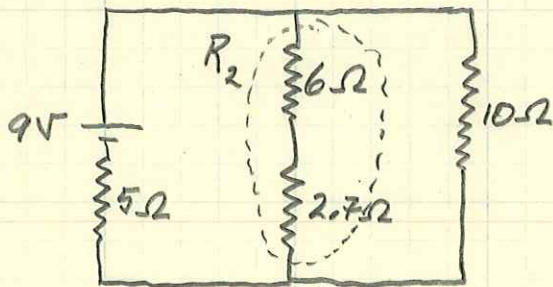
First, find current "drawn from" (through) the battery. So we need to find the equivalent resistance of the whole circuit. I'll do it in steps, redrawing the new circuit after each step.

①



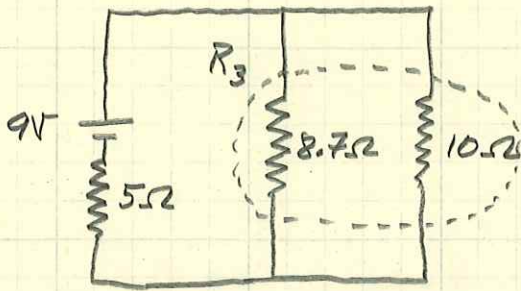
$$R_1 = \frac{(4.0\Omega)(8.0\Omega)}{4.0\Omega + 8.0\Omega} = 2.7\Omega$$

②



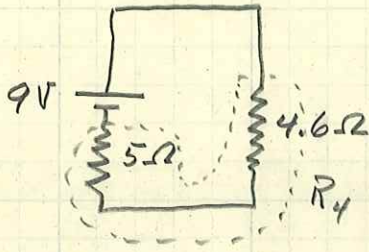
$$R_2 = 6.0\Omega + 2.7\Omega = 8.7\Omega$$

③



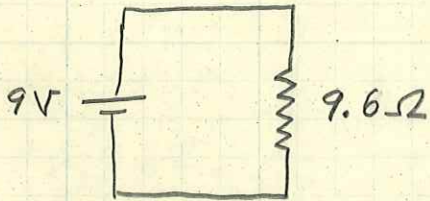
$$R_3 = \frac{(8.7\Omega)(10\Omega)}{8.7\Omega + 10\Omega} = 4.6\Omega$$

④



$$R_4 = 5.0\Omega + 4.6\Omega = 9.6\Omega$$

⑤



$$\Rightarrow I_{\text{batt}} = \frac{9.0\text{V}}{9.6\Omega} = \underline{0.93\text{A}}$$

All of I_{batt} goes through the 5.0Ω resistor

$$\Rightarrow I_5 = \underline{0.93\text{A}}$$

$$\Delta V_5 = (0.93\text{A})(5.0\Omega) = \underline{4.7\text{V}}$$

Looking at circuit ③, we now can find ΔV across the 10Ω resistor (and the 8.7Ω resistor)

$$\Rightarrow \Delta V_{10} = 9.0\text{V} - 4.7\text{V} = \underline{4.3\text{V}}$$

$$I_{10} = \frac{4.3\text{V}}{10\Omega} = \underline{0.43\text{A}}$$

$$(I_{8.7} = \frac{4.3\text{V}}{8.7\Omega} = 0.50\text{A})$$

Looking at circuit ②, all of $I_{8.7}$ goes through the $6.0\ \Omega$ resistor (and the $2.7\ \Omega$ resistor)

$$\Rightarrow I_6 = \underline{\underline{0.50\ A}}$$

$$\Delta V_6 = (0.50\ A)(6.0\ \Omega) = \underline{\underline{3.0\ V}}$$

$$(\Delta V_{2.7} = (0.50\ A)(2.7\ \Omega) = 1.3\ V)$$

Finally looking at circuit ①, we know the ΔV across the $4.0\ \Omega$ resistor and the $8.0\ \Omega$ resistor

$$\Rightarrow \Delta V_4 = \underline{\underline{1.3\ V}}$$

$$I_4 = \frac{1.3\ V}{4.0\ \Omega} = \underline{\underline{0.33\ A}}$$

$$\Delta V_8 = \underline{\underline{1.3\ V}}$$

$$I_8 = \frac{1.3\ V}{8.0\ \Omega} = \underline{\underline{0.17\ A}}$$

Summarizing

$$\Delta V_{\text{batt}} = 9.0\ V$$

$$I_{\text{batt}} = 0.93\ A$$

$$\Delta V_5 = 4.7\ V$$

$$I_5 = 0.93\ A$$

$$\Delta V_{10} = 4.3\ V$$

$$I_{10} = 0.43\ A$$

$$\Delta V_6 = 3.0\ V$$

$$I_6 = 0.50\ A$$

$$\Delta V_4 = 1.3\ V$$

$$I_4 = 0.33\ A$$

$$\Delta V_8 = 1.3\ V$$

$$I_8 = 0.17\ A$$