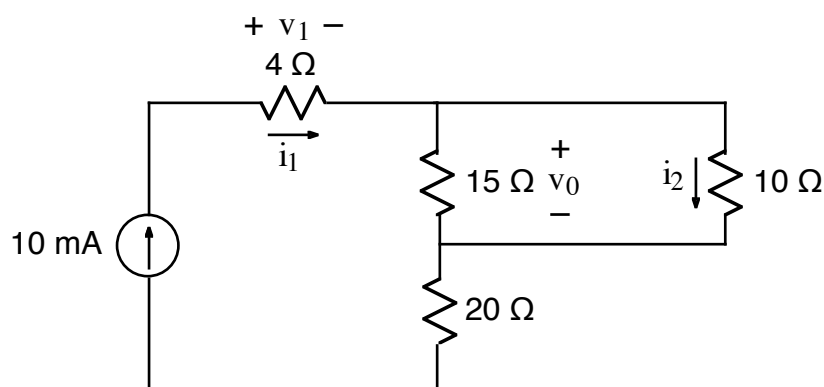


Ex:



Calculate i_1 , i_2 , and v_0 .

sol'n: Starting with v-loops, we observe that v-loops passing thru the 10mA source would require defining a voltage drop for a current source. This is unconstructive, as it adds an eqn and an unknown value.

Thus, we use only the v-loop on the right:

$$+v_0 - v_2 = 0V \quad \text{or} \quad v_2 = v_0$$

This means components in parallel have the same voltage drop.

Turning to currents, we observe that 10 mA from the i-source flows thru the 4 Ω and 20 Ω resistors.

$$i_1 = i_3 = 10 \text{ mA}$$

From Ohm's law, we have $v_1 = 10 \text{ mA} \cdot 4 \Omega = 40 \text{ mV}$
 $v_3 = 10 \text{ mA} \cdot 20 \Omega = 200 \text{ mV}$

For current sums, we consider the top-center node:

$$-i_1 + i_0 + i_2 = 0A$$

$$\text{or } -10mA + i_0 + i_2 = 0A$$

$$\text{or } i_0 + i_2 = 10mA$$

Using Ohm's law, we have eq'ns for i_0 and i_2 :

$$V_0 = i_0 \cdot 15\Omega \quad V_2 = i_2 \cdot 10\Omega = V_0$$

Substituting into the current eq'n, we have

$$\frac{V_0}{15\Omega} + \frac{V_0}{10\Omega} = 10mA$$

$$\text{or } V_0 \left(\frac{1}{15\Omega} + \frac{1}{10\Omega} \right) = 10mA$$

$$\text{or } V_0 = 10mA \cdot \frac{1}{\frac{1}{15\Omega} + \frac{1}{10\Omega}}$$

$$= 10mA \cdot \frac{10\Omega \cdot 15\Omega}{10\Omega + 15\Omega}$$

$$V_0 = 10mA \cdot 6\Omega = 60mV$$

Using Ohm's law, we have

$$i_2 = \frac{V_0}{10\Omega} = \frac{60mV}{10\Omega} = 6mA$$