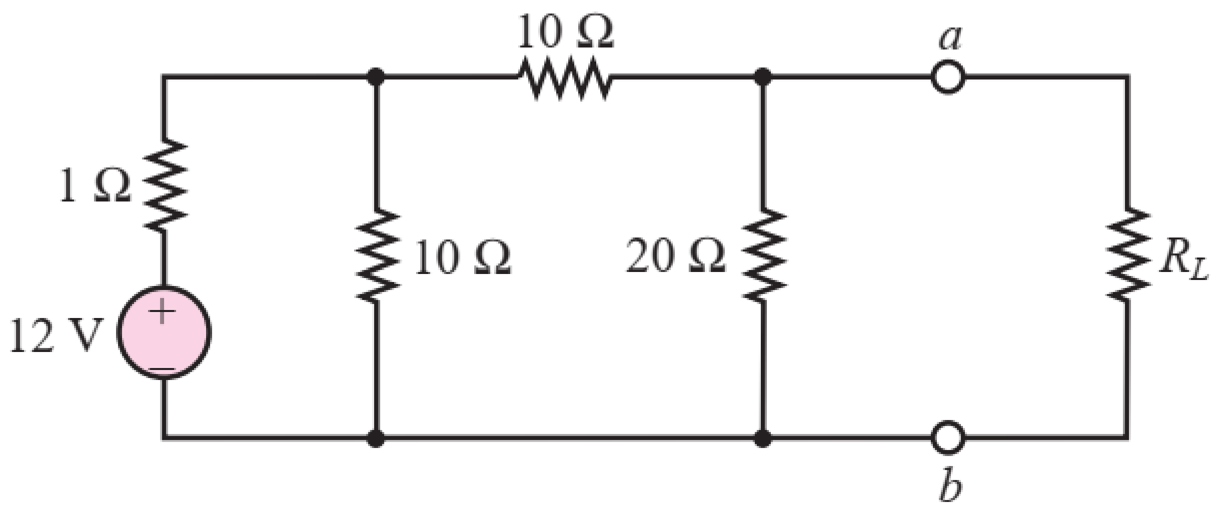
1.

For the circuit below, find the Thévenin equivalent resistance seen by the load resistor R_L.



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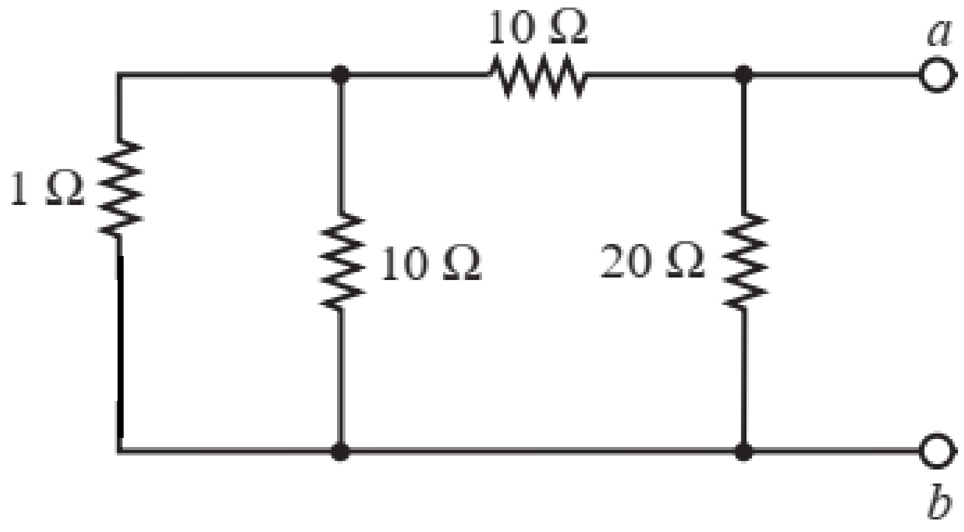
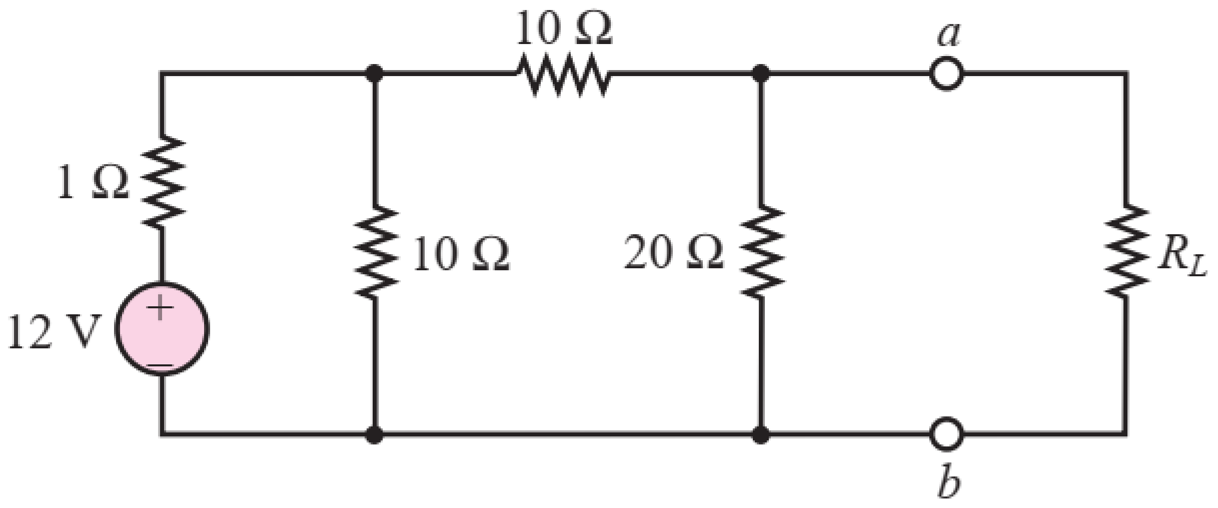
For the circuit below, find the Thévenin equivalent resistance seen by the load resistor R_L.



$$R_T = ((1\Omega \,||\, 10\Omega) + 10\ \Omega) \,||\, 20\ \Omega = \left[\frac{1}{\left[\left(1+\frac{1}{10}\right)^{-1}+10\right]}+\frac{1}{20}\right]^{-1} = 7.059\ \Omega$$

1.

Find the Thevenin voltage V_T.



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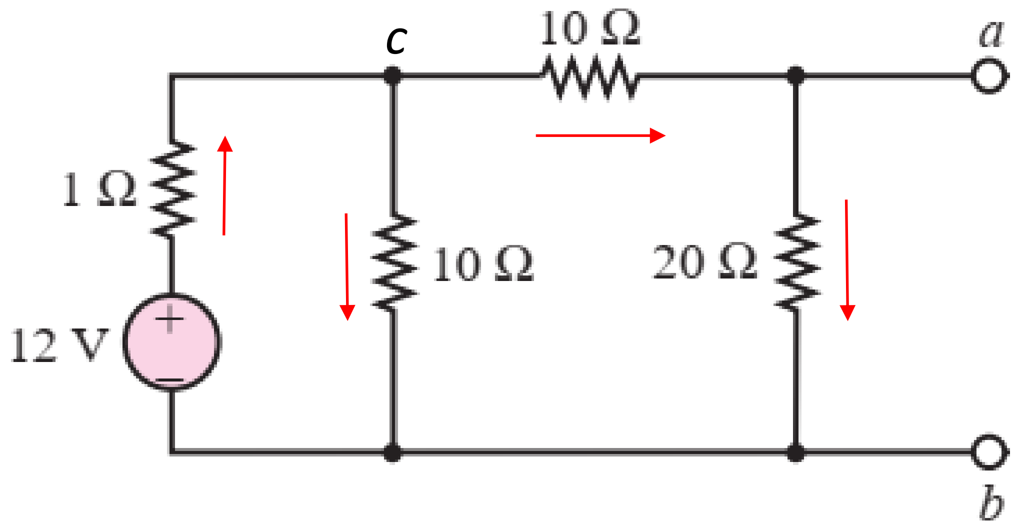
Find the Thevenin voltage V_T.



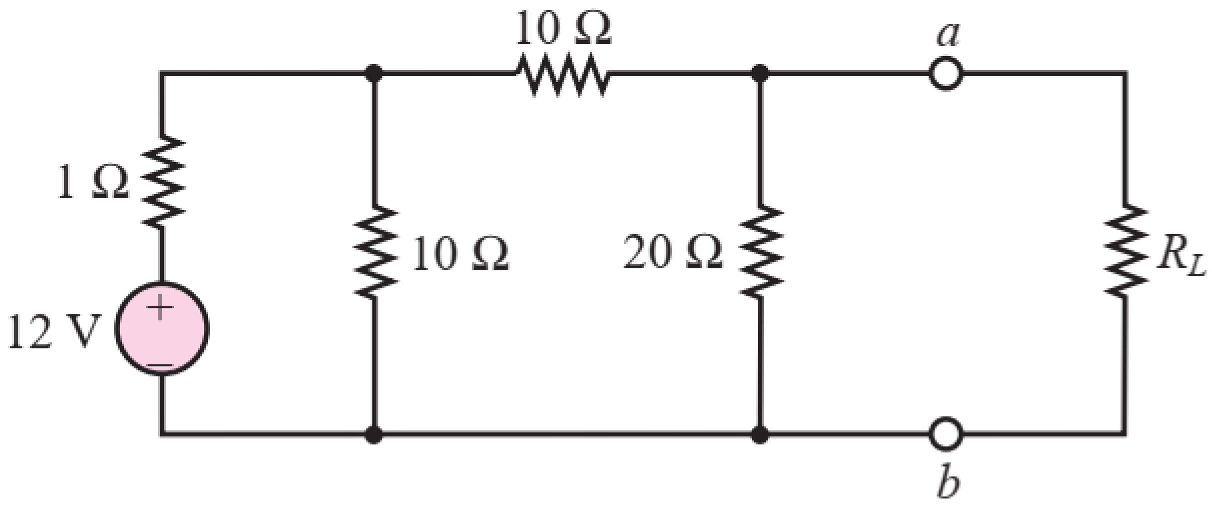
Vb = 0

$$\begin{cases} \dfrac{12 - Vc}{1} - \dfrac{Vc - Va}{10} - \dfrac{Vc}{10} = 0 \\ \dfrac{Vc - Va}{10} - \dfrac{Va}{20} = 0 \end{cases}$$

Answer: $V_T = Va = 7.059$ V

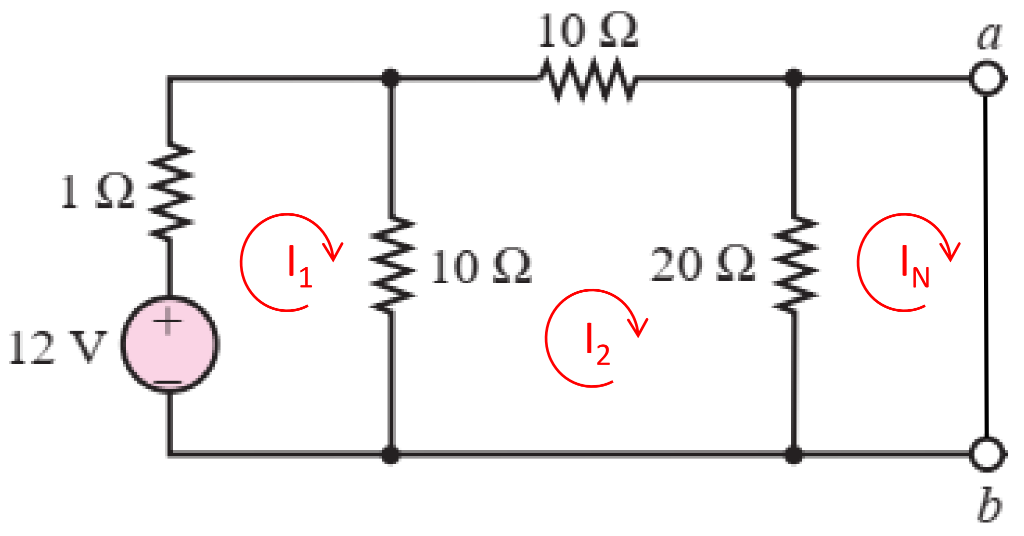
1.

Find the Norton Current I_N.

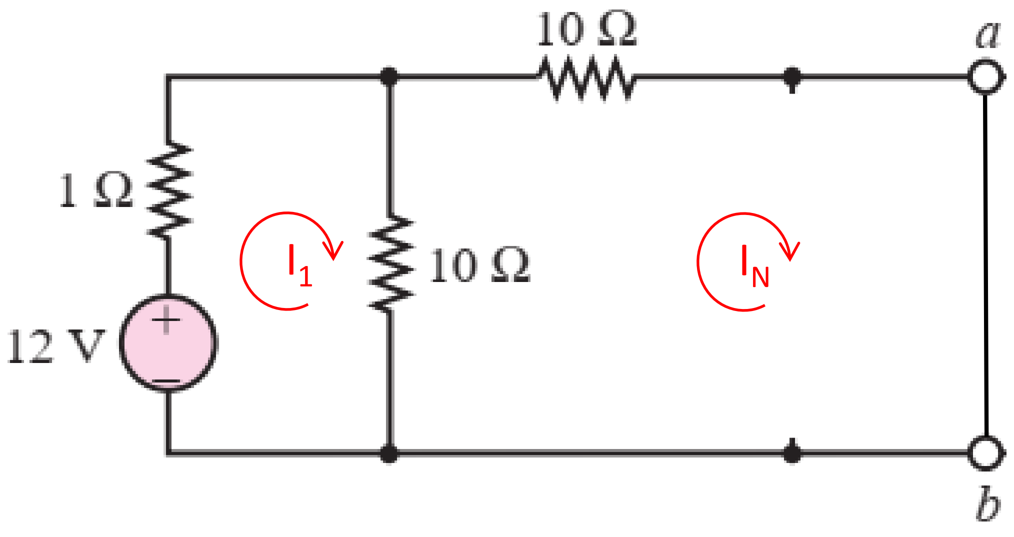


2.

Find the Norton Current I_N.



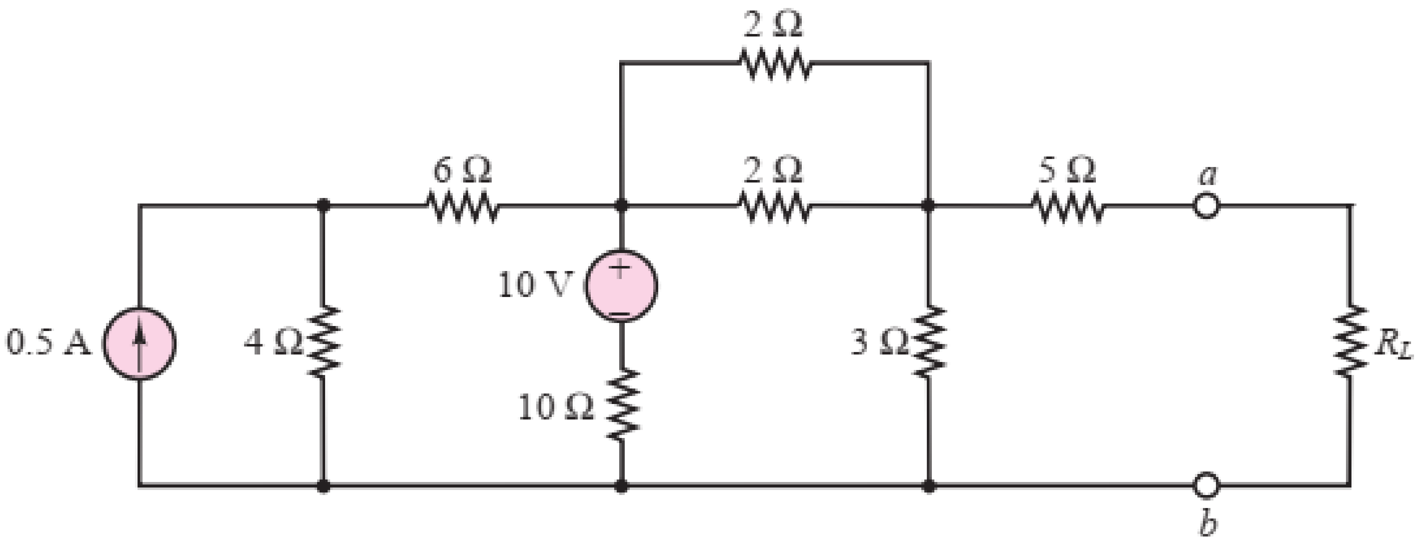
$$\begin{cases} 12 - I_1 \cdot 1 - \left(I_1 - I_N\right) \cdot 10 = 0 \\ -\left(I_N - I_1\right) \cdot 10 - I_N \cdot 10 = 0 \end{cases}$$



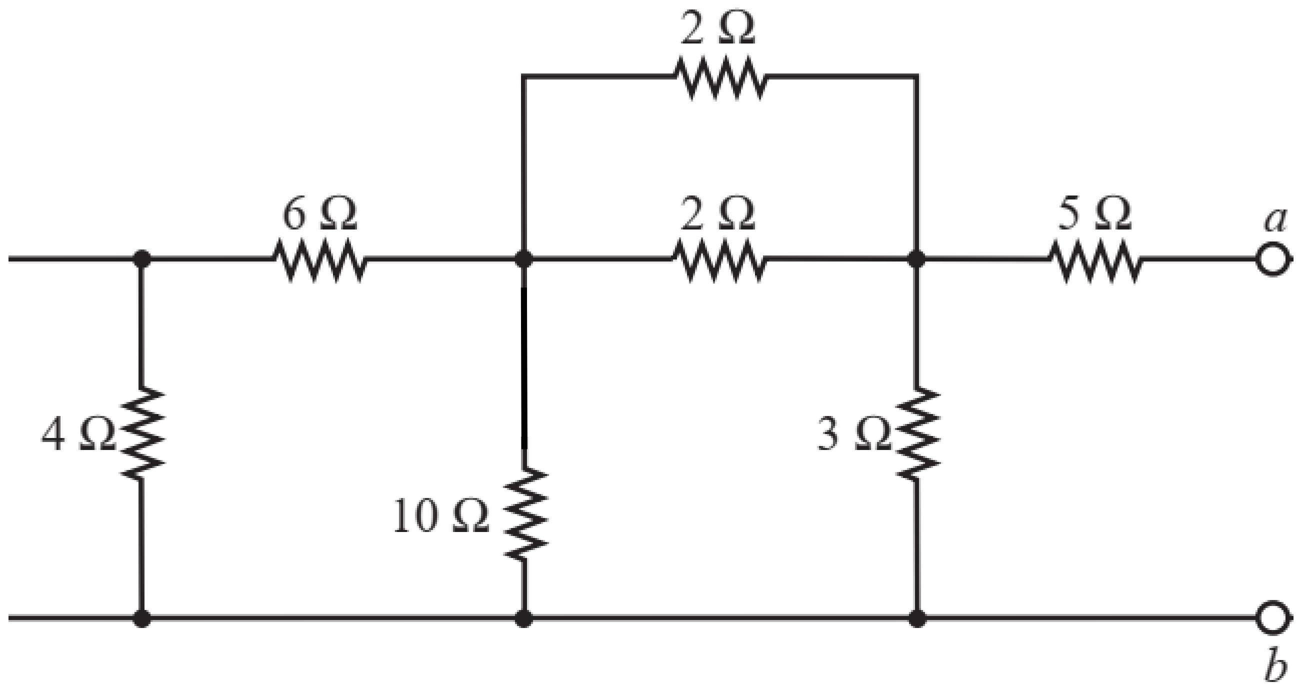
$$\left.\begin{aligned} &\text{Answer: } I_N = 1\text{ A} \\ &V_T = 7.059\text{ V} \\ &R_T = 7.059\ \Omega \end{aligned}\right\} \quad V_T = I_N R_T$$

2.

Find the Thévenin equivalent resistance seen by the load resistor R_L in the following circuit.



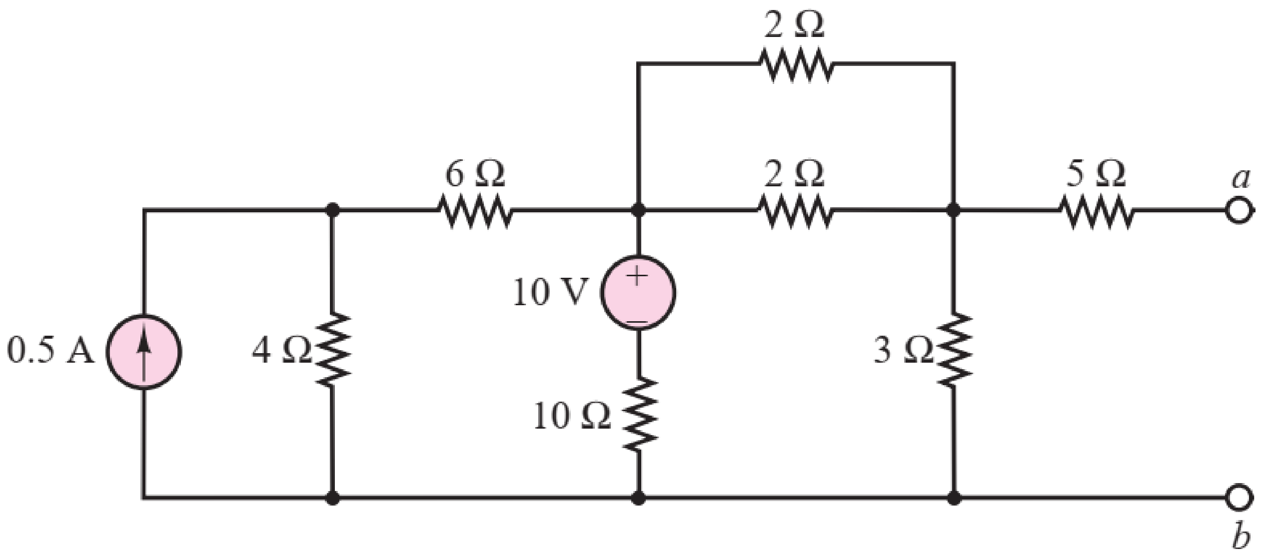
2.



$$R_T = ((4\Omega + 6\Omega)\ ||\ 10\ \Omega) + (2\ \Omega||2\ \Omega)\ ||\ 3\ \Omega + 5\ \Omega = \left[\frac{1}{\left[\left(\frac{1}{4+6} + \frac{1}{10}\right)^{-1} + \left(\frac{1}{2} + \frac{1}{2}\right)^{-1}\right]} + \frac{1}{3}\right]^{-1} + 5 = 7\ \ \Omega$$

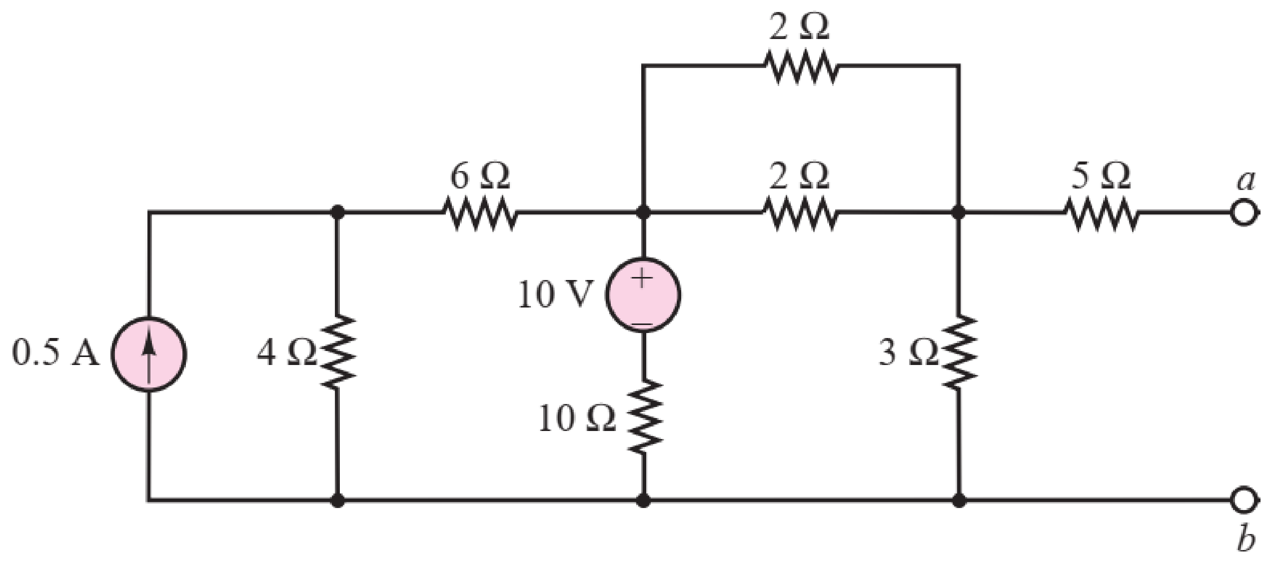
2.

Find the Thevenin voltage V_T.



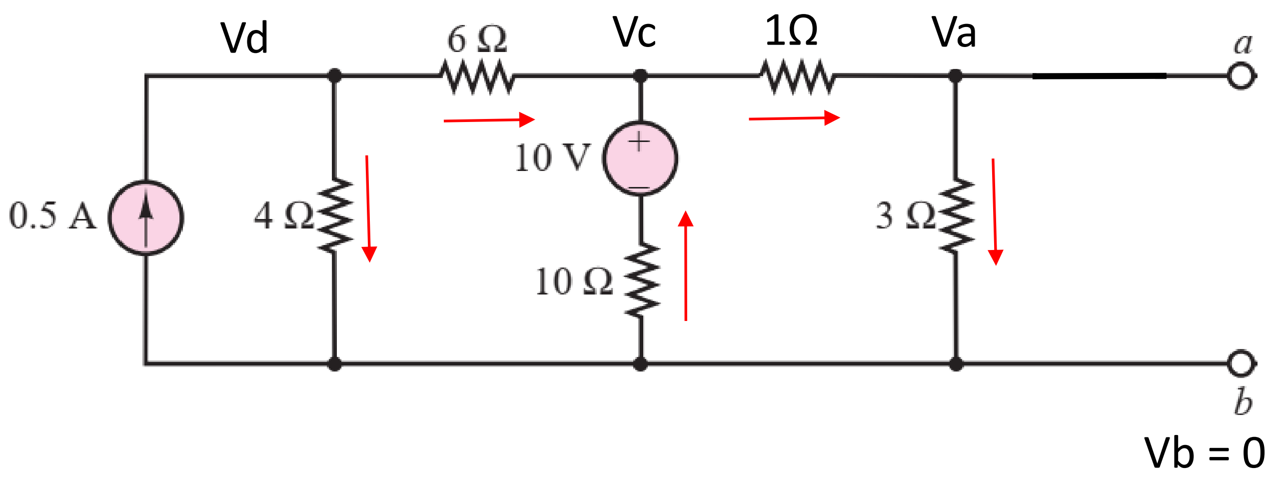
2.

Find the Thevenin voltage V_T.



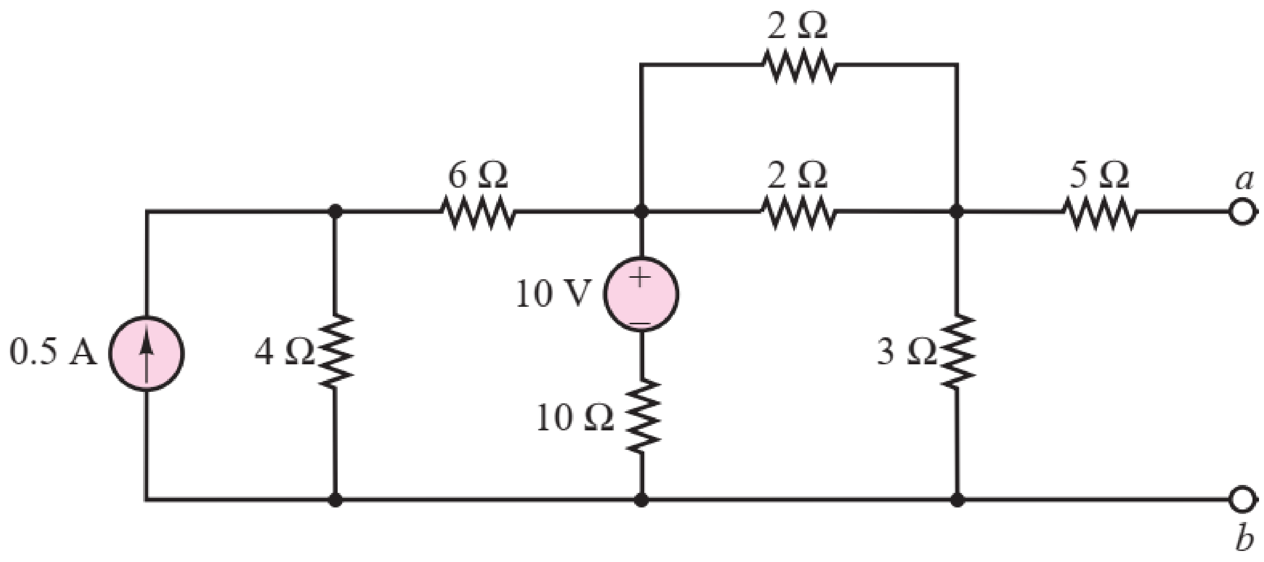
$$\begin{cases} 0.5 - \dfrac{Vd}{4} - \dfrac{Vd - Vc}{6} = 0 \\ \dfrac{Vd - Vc}{6} + \dfrac{10 - Vc}{10} - \dfrac{Vc - Va}{1} = 0 \\ \dfrac{Vc - Va}{1} - \dfrac{Va}{3} = 0 \end{cases}$$

Answer: $V_T = Va = 2$ V



2.

Find the Norton Current I_N.



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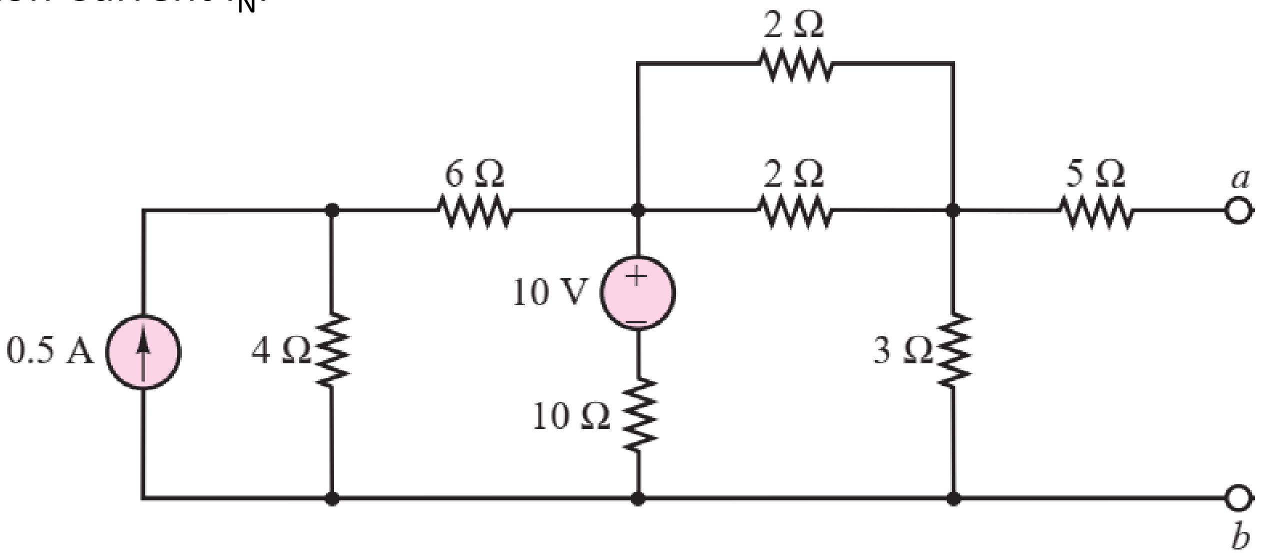
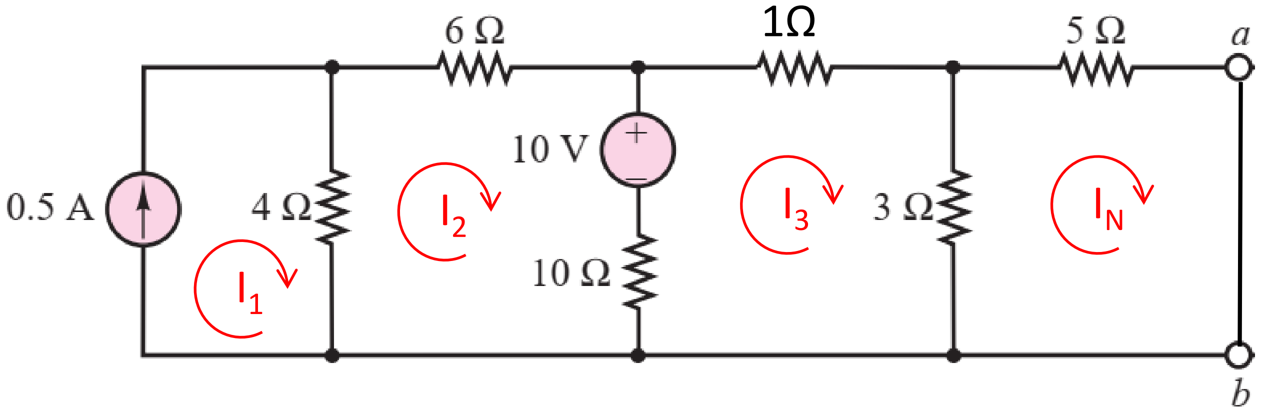
Find the Norton Current I_N.



$$\begin{cases} -(I_2 - I_1)\cdot 4 - I_2\cdot 6 - 10 - (I_2 - I_3)\cdot 10 = 0 \\ -(I_3 - I_3)\cdot 10 + 10 - I_3\cdot 1 - (I_3 - I_N)3 = 0 \\ -(I_N - I_3)\cdot 3 - I_N\cdot 5 = 0 \end{cases}$$



Answer: $I_N = 0.286$ A

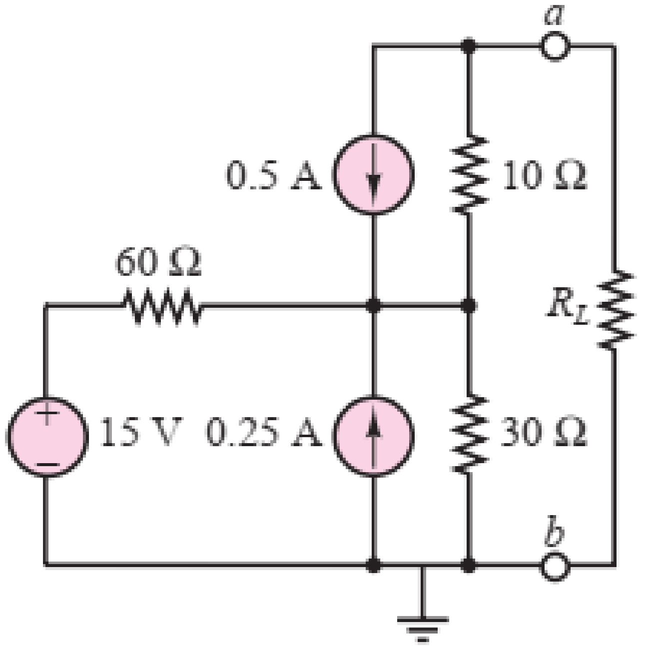
$V_T = 2$ V

$R_T = 7\ \Omega$

$V_T = I_N R_T$

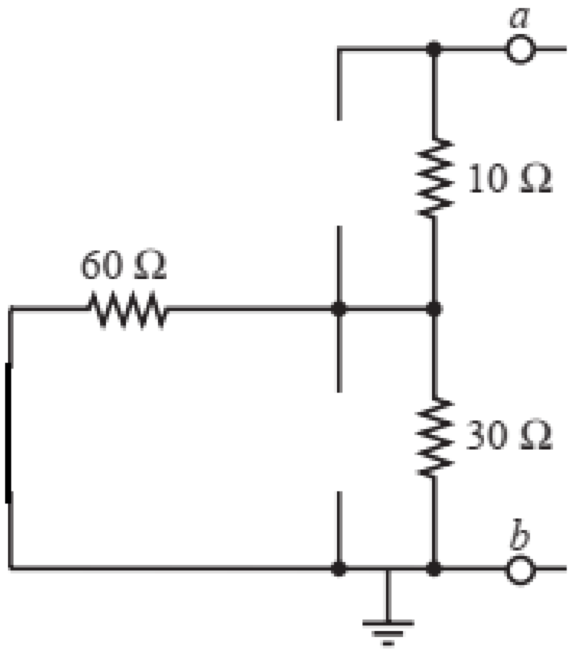
3.

Find the Thevenin equivalent circuit for the circuit in the figure below



3.

Find the Thevenin Resistance R_T.



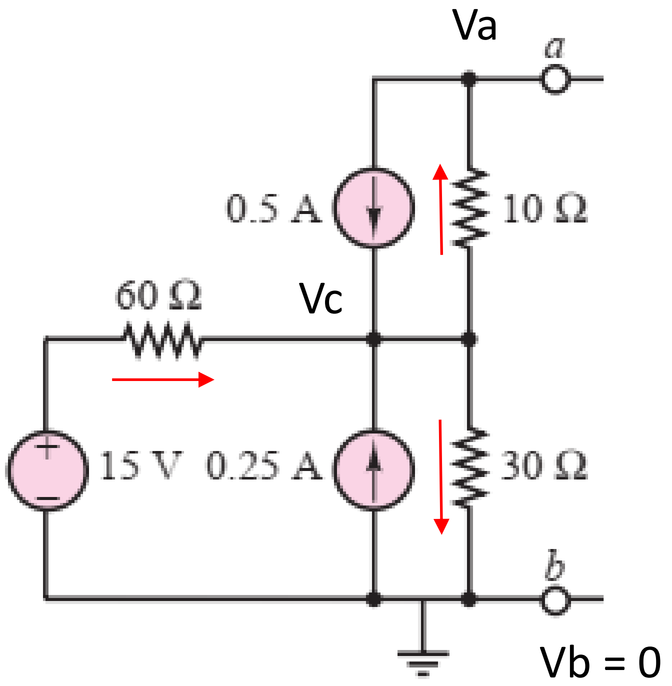
$R_T = (60\ \Omega)\ ||\ 30\ \Omega) + 10\ \Omega = 20\ \Omega + 10\ \Omega = 30\ \Omega$

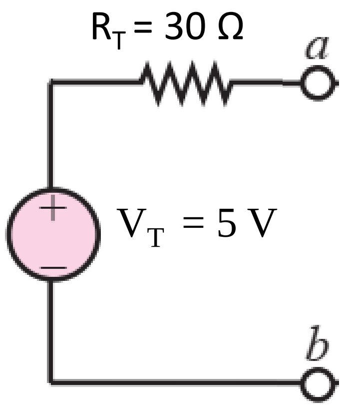
3.

Find the Thevenin voltage V_T.

$$\begin{cases} \dfrac{15 - Vc}{60} + 0.5 + 0.25 - \dfrac{Vc - Va}{10} - \dfrac{Vc}{30} = 0 \\ -0.5 + \dfrac{Vc - Va}{10} = 0 \end{cases}$$

Answer: $V_T = Va = 5$ V



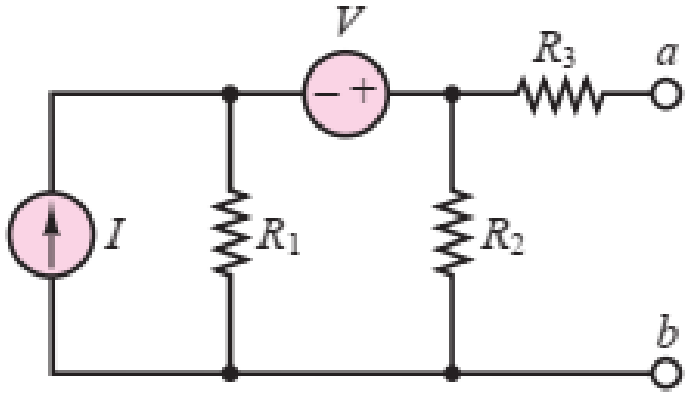


Thevenin equivalent circuit

4.

Determine the Norton current and the Norton equivalent for the circuit of Figure

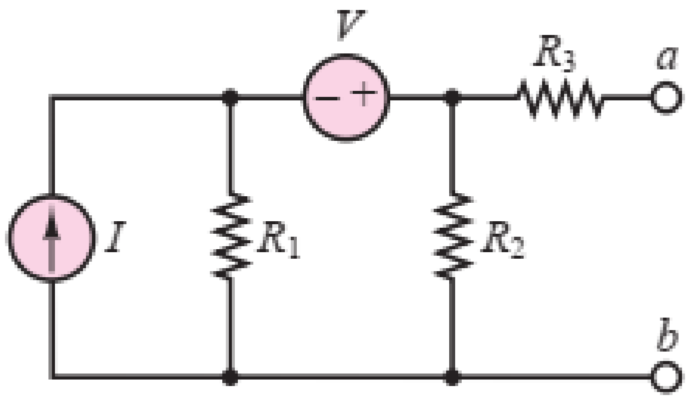
$V = 6$ V; $I = 2$ A; $R_1 = 6\ \Omega$; $R_2 = 3\ \Omega$; $R_3 = 2\ \Omega$.

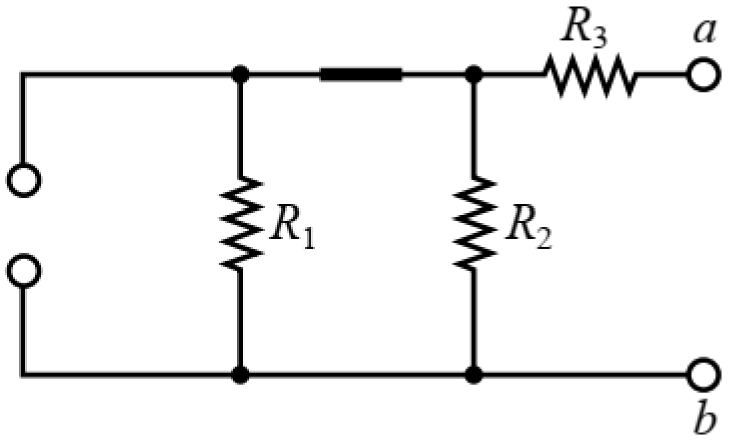


4.

Determine the Norton current and the Norton equivalent for the circuit of Figure

$V = 6$ V; $I = 2$ A; $R_1 = 6\ \Omega$; $R_2 = 3\ \Omega$; $R_3 = 2\ \Omega$.



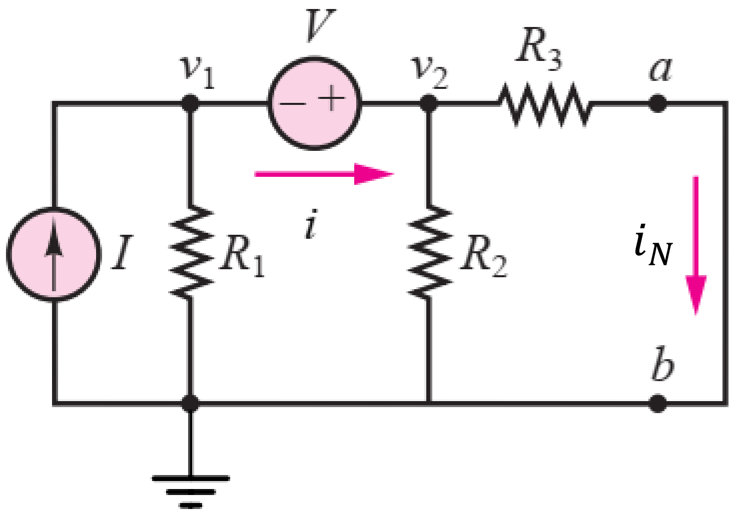


$$R_T = R_1 \| R_2 + R_3 = 6 \| 3 + 2 = 4\ \Omega$$

4.

Determine the Norton current and the Norton equivalent for the circuit of Figure

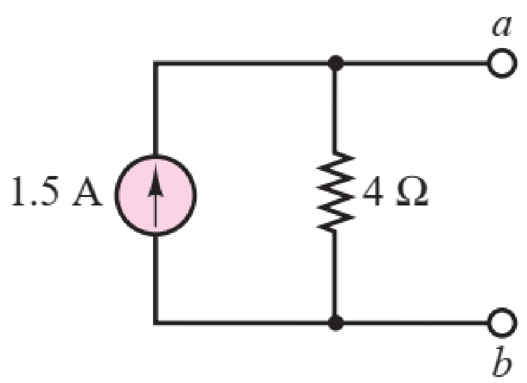
$V = 6$ V; $I = 2$ A; $R_1 = 6\ \Omega$; $R_2 = 3\ \Omega$; $R_3 = 2\ \Omega$.



$$\begin{cases} I - \dfrac{v_1}{R_1} - i = 0 & \text{node 1} \\ i - \dfrac{v_2}{R_2} - \dfrac{v_2}{R_3} = 0 & \text{node 2} \\ v_1 = v_2 - V \end{cases}$$

$i = 2.5$ A

$v_2 = 3$ V.



Norton equivalent circuit

$$\text{Answer:}\quad i_N = i\,\frac{\dfrac{1}{R_3}}{\dfrac{1}{R_2}+\dfrac{1}{R_3}} = 1.5\text{ A}$$