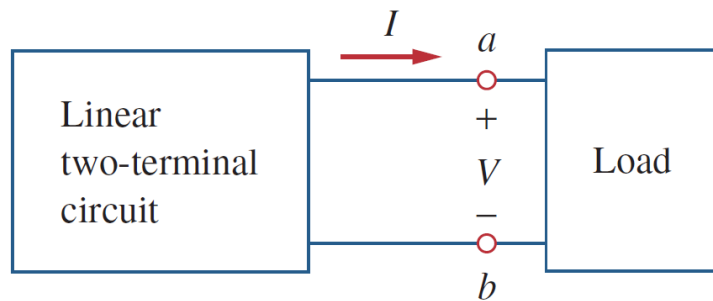


# Thevenin's Theorem

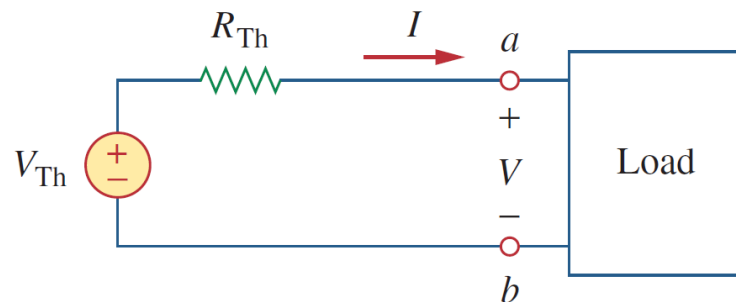
By: DR. Shiple

# Thevenin's theorem

- Find  $R_{TH}$  when all sources =0.
- By using , earlier techniques to find  $V_{TH}$



(a)



**Hermann Ludwig Ferdinand von Helmholtz** was a German physicist and physician who made significant contributions in several scientific fields, particularly hydrodynamic stability.

1853



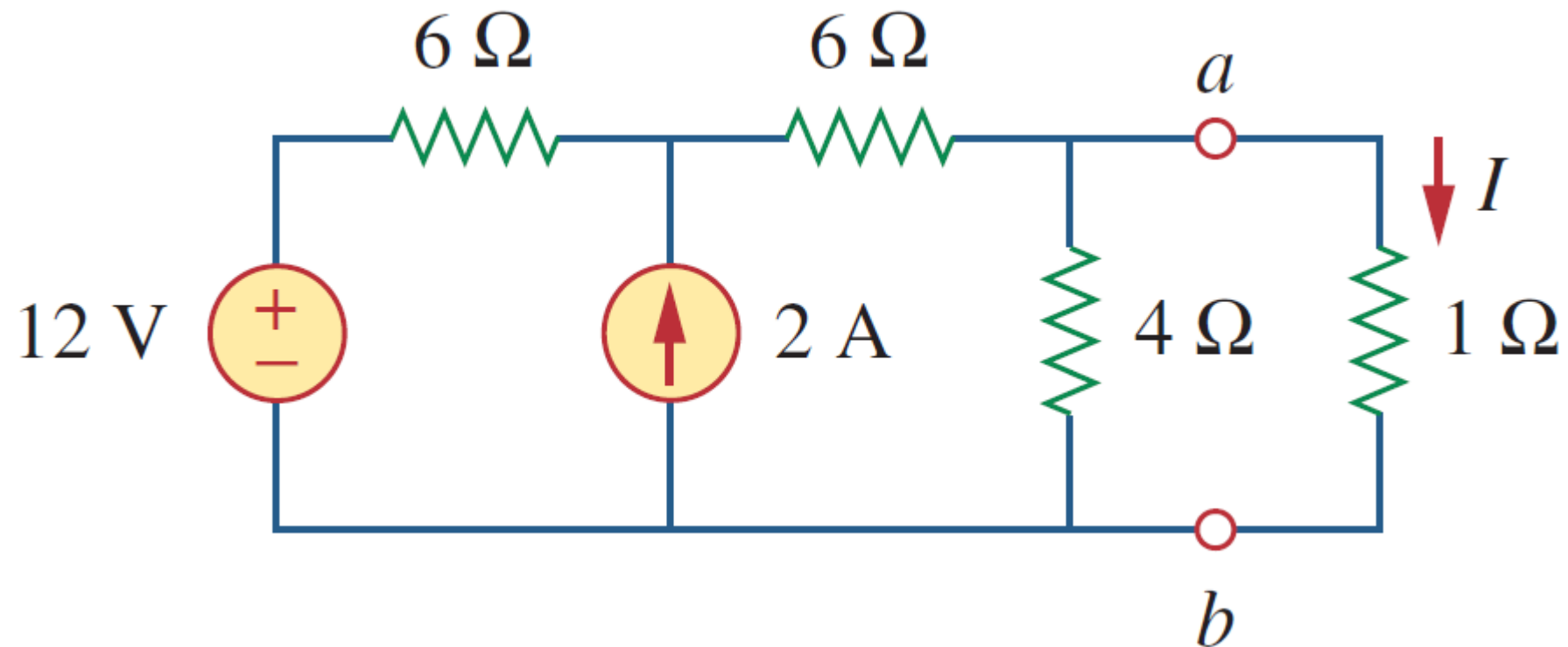
**Léon Charles Thévenin** was a French telegraph engineer who extended Ohm's law to the analysis of complex electrical circuits.

1883



# Exercise

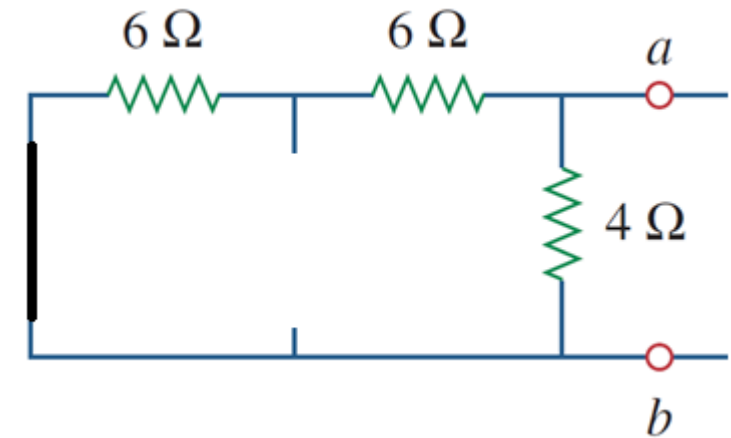
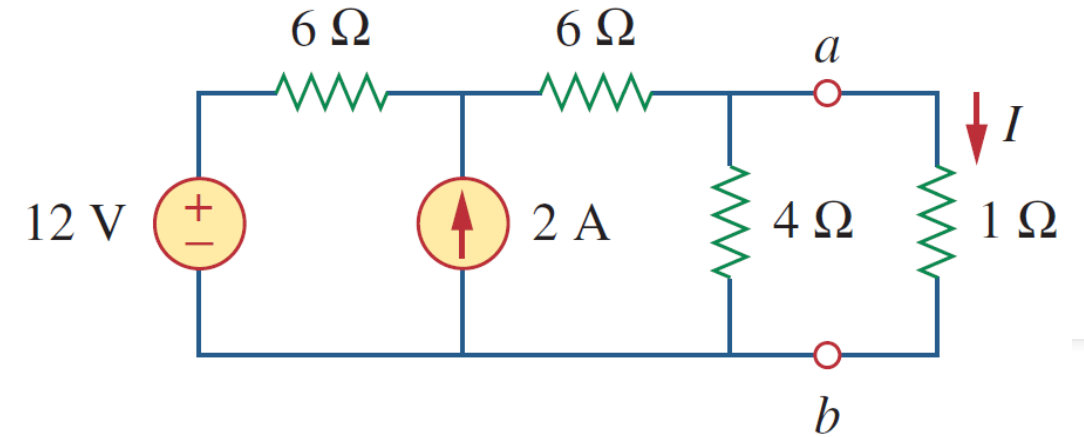
Find value of  $I$ ?



# Exercise

Find value of  $I$ ?

$$R_{TH} = \frac{12 * 4}{12 + 4} = 3\Omega$$



# Exercise

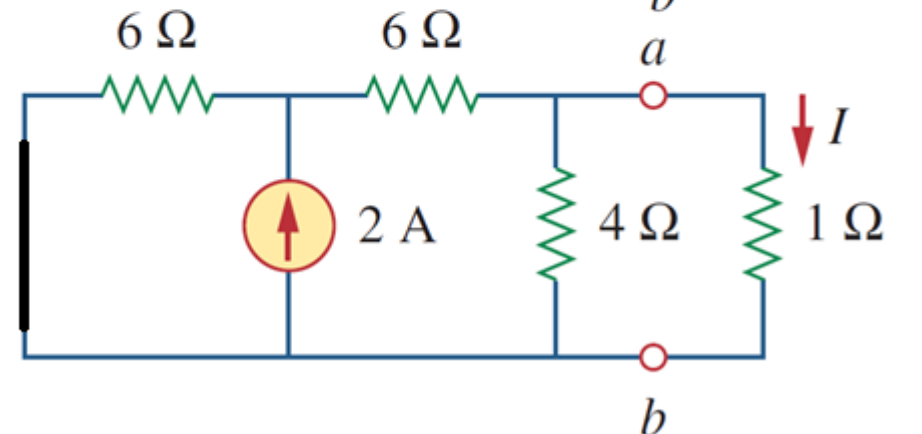
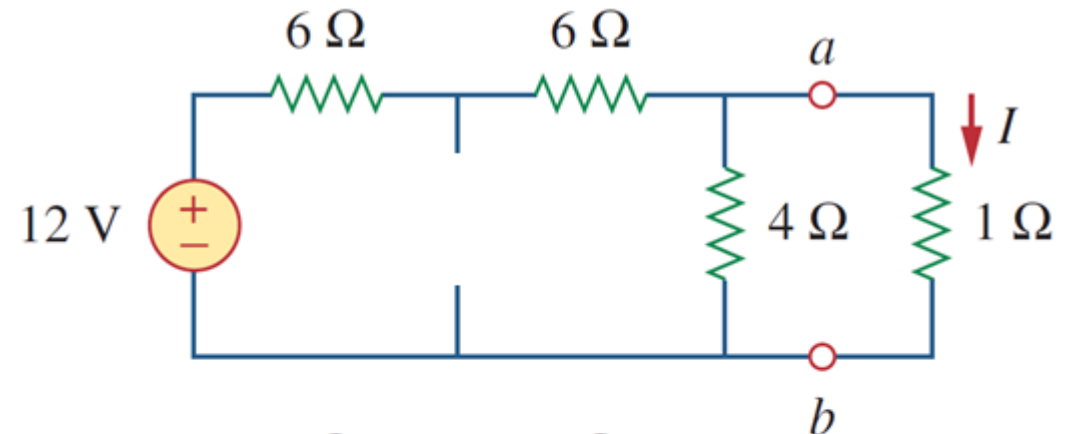
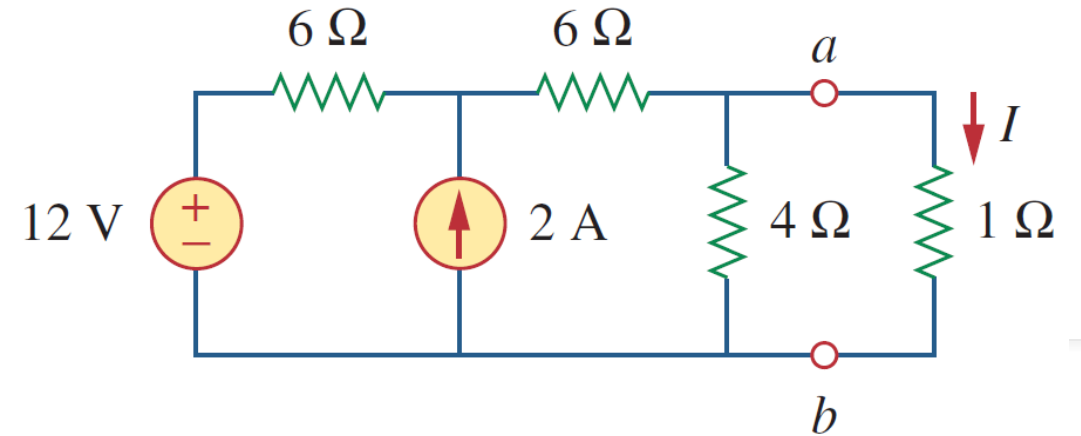
Find value of  $I$ ?

$$V_1 = \frac{12 * 4}{16} = 3V$$

$$i_1 = \frac{2 * 6}{16} = 0.75A$$

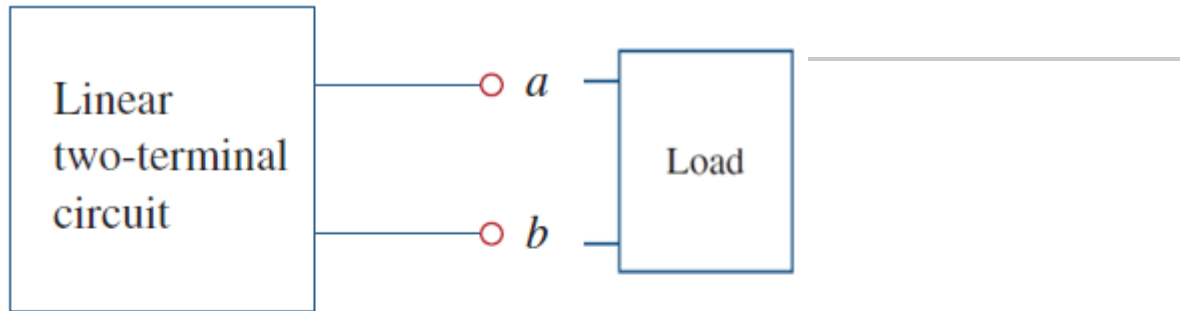
$$V_1 = 0.75 * 4 = 3V$$

$$V_{TH} = 3V + 3V = 6V$$

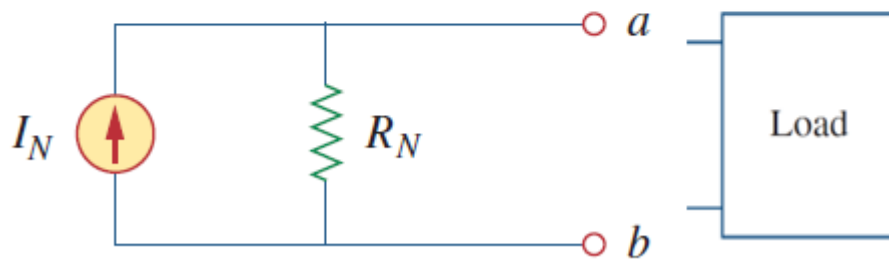


# Norton's theorem

- Find  $R_{TH}$  when all sources =0.
- By using , earlier techniques to find  $V_{TH}$



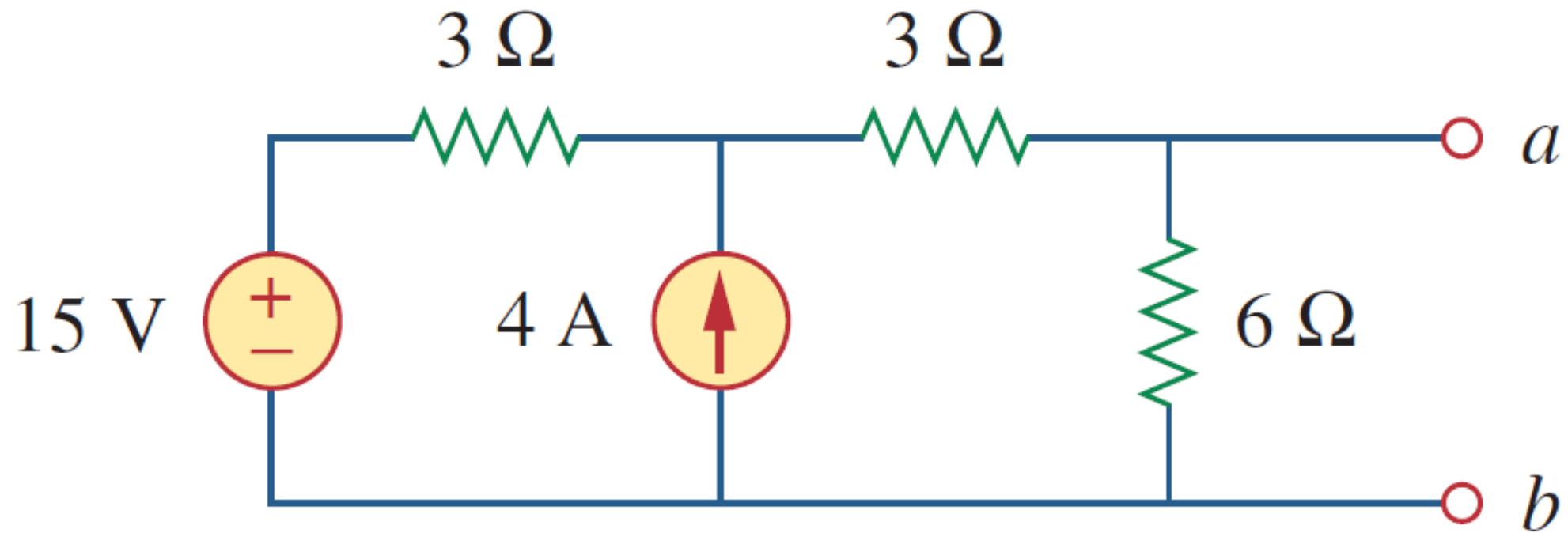
(a)



(b)

## Exercise

Find value of  $I$  (NORTON )?

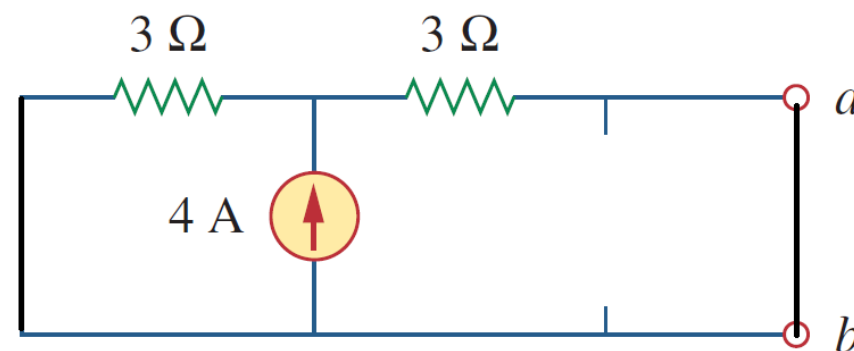
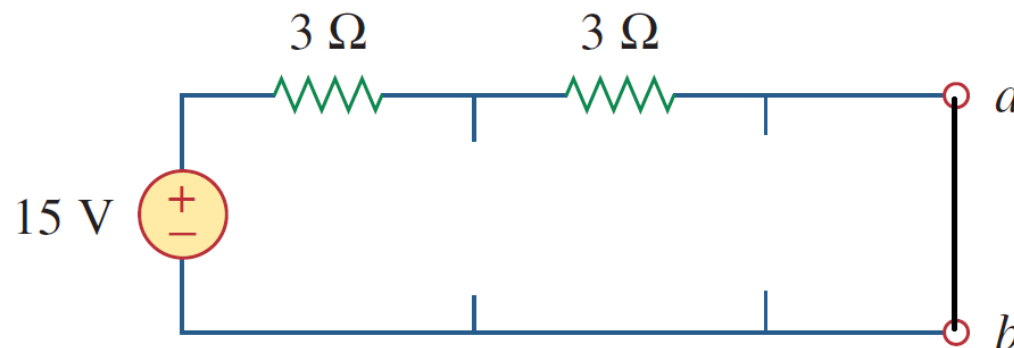
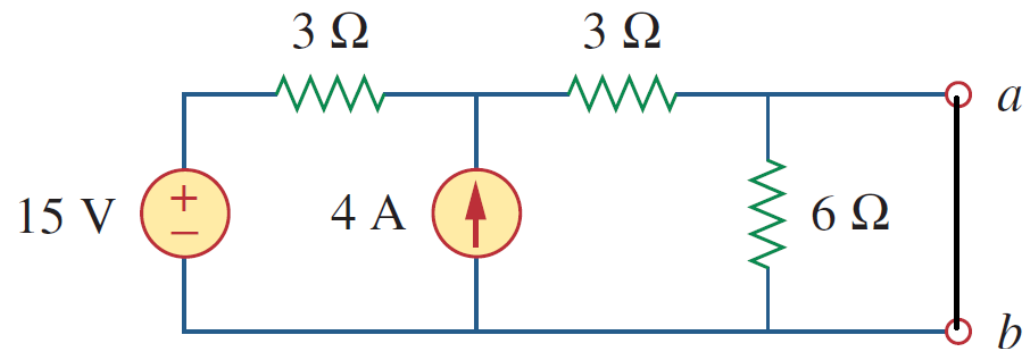


# Exercise

$$i_1 = \frac{15}{6} = 2.5A$$

$$i_1 = 4 * \frac{3}{6} = 2A$$

$$i_1 = 2.5 + 2 = 4.5A$$

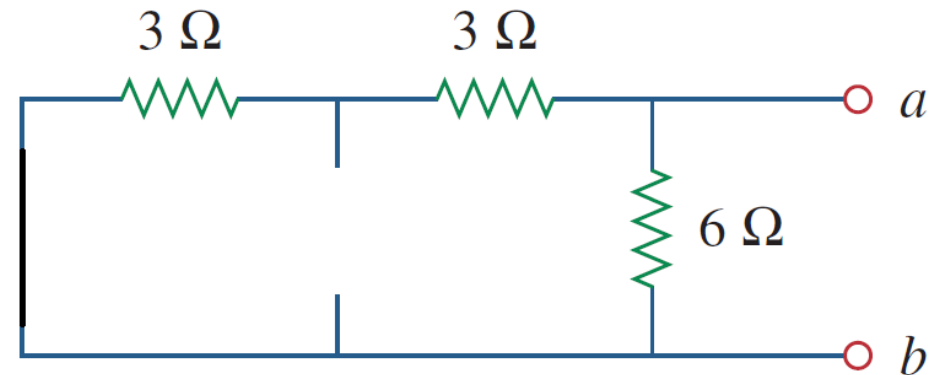




# Exercise

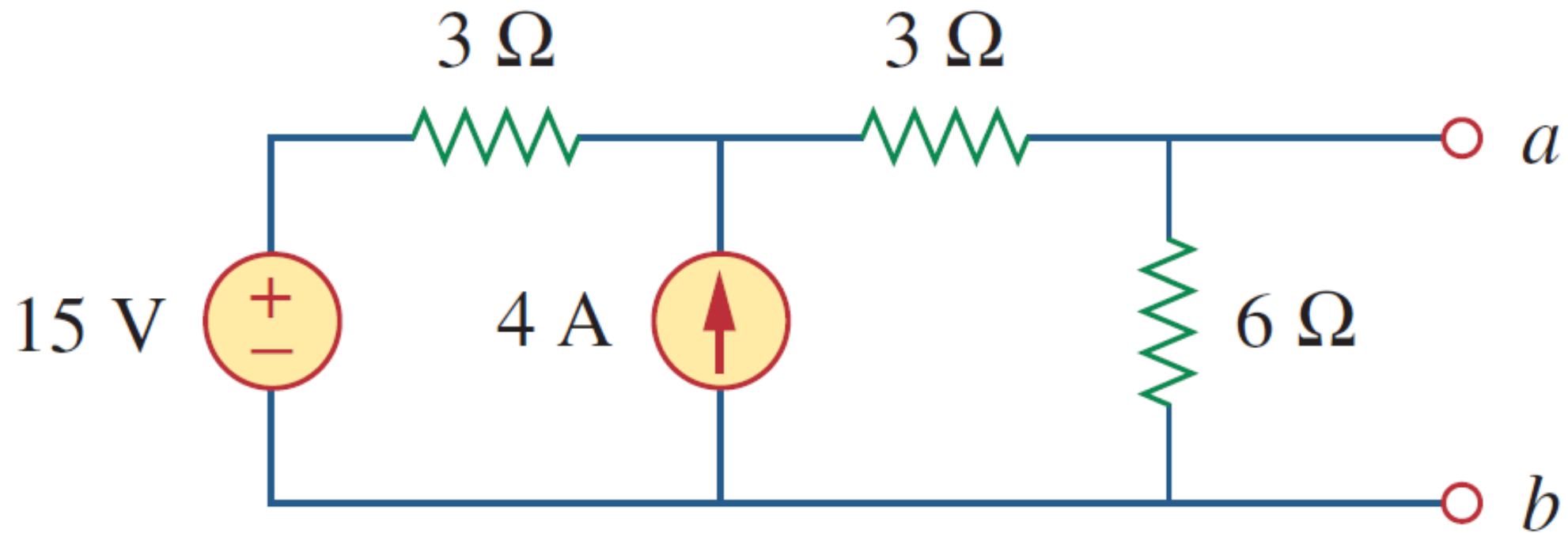
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$$R_N = \frac{6 * (3 + 3)}{12} = 3\Omega = R_{TH}$$



# Exercise

Find value of  $I$  (Thevenin )?



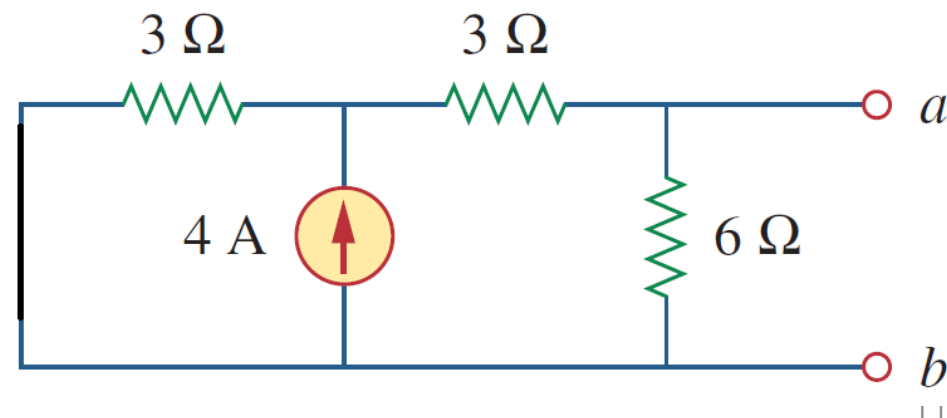
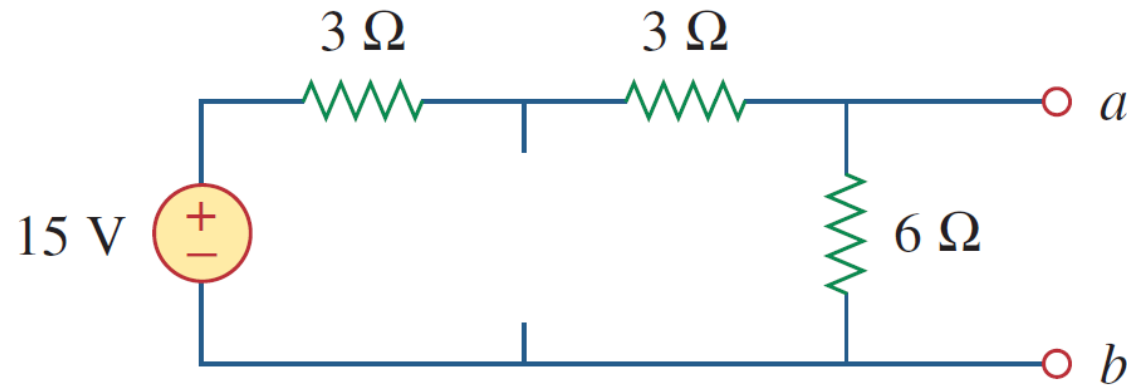
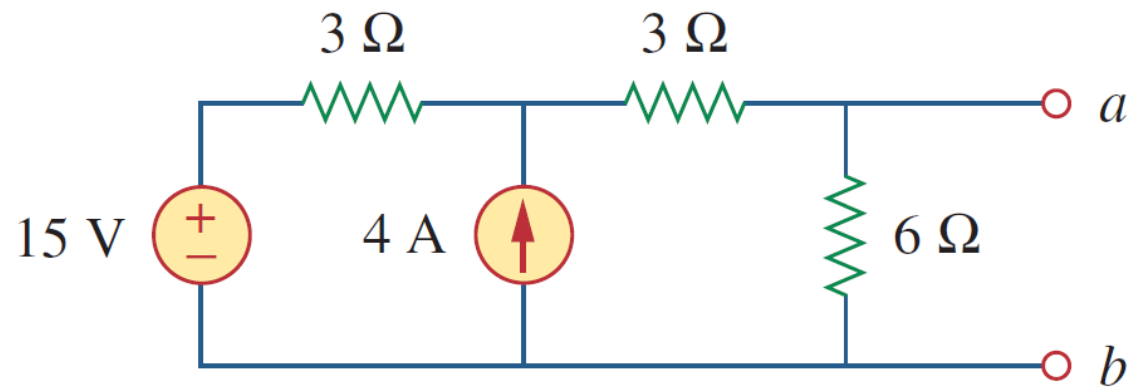


$$v_1 = \frac{15 * 6}{12} = 7.5V$$

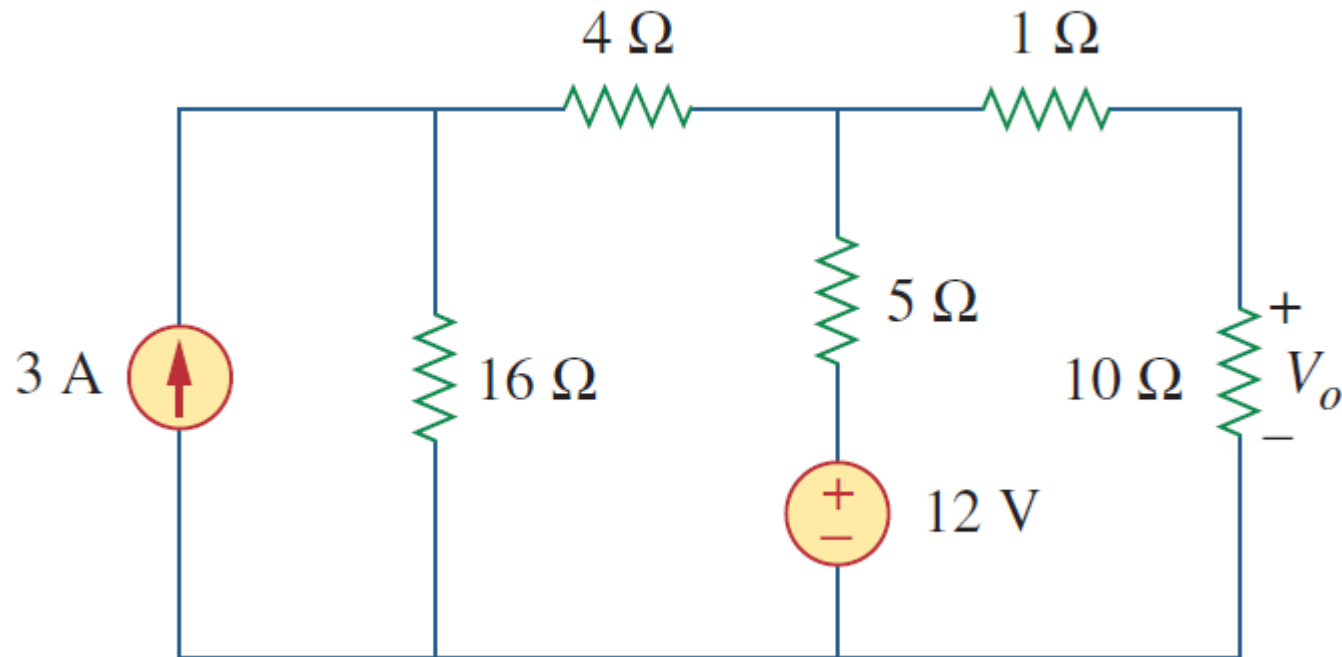
$$i_1 = 4 * \frac{3}{12} = 1A$$

$$v_1 = 1 * 6 = 6V$$

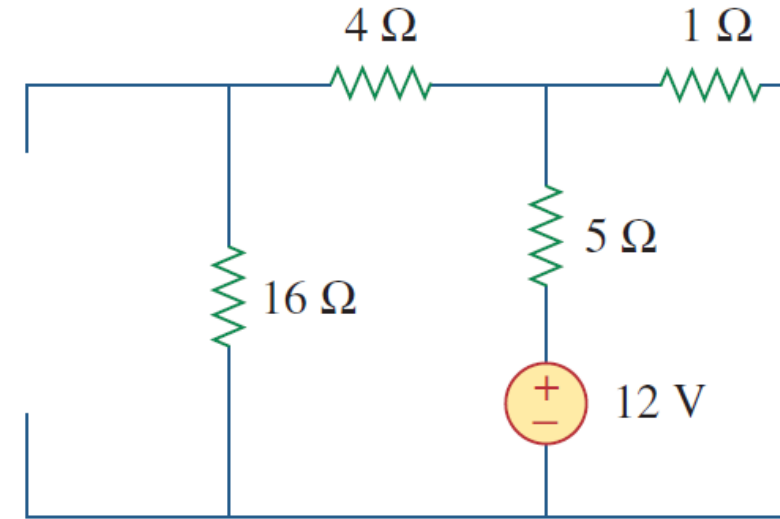
$$v_{TH} = 7.5 + 6 = 13.5V = R_{TH} * I_N$$



# Challenge (use Norton & Thevenin)

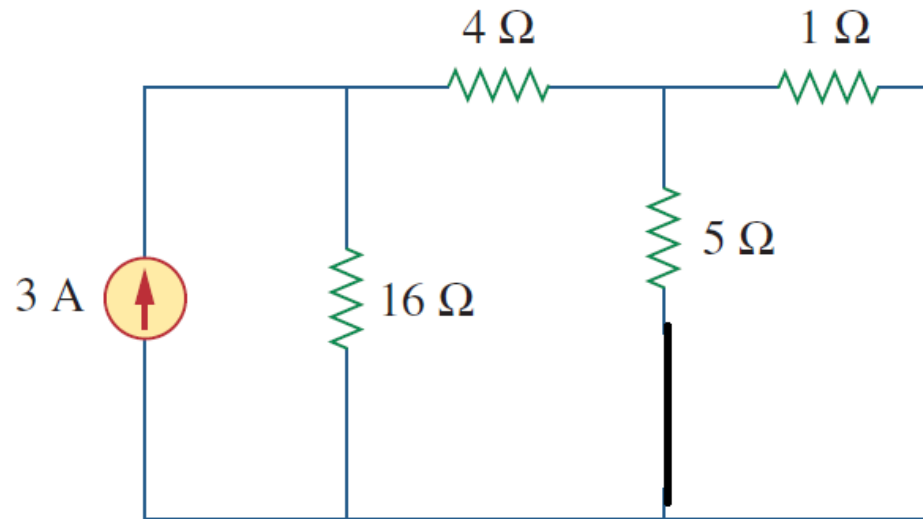


# Challenge (Thevenin)



$$v_{TH} = 19.2 \text{ V} \quad R_{TH} = 5 \Omega$$

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# Challenge (NORTON)

- $I_4 = 2.3A \Rightarrow I_1 = 1.92A$       $R_{TH} = 5\Omega$
- $I_1 = 1.92A \Rightarrow I_N = 3.84A$       $R_{TH} = 5\Omega$

