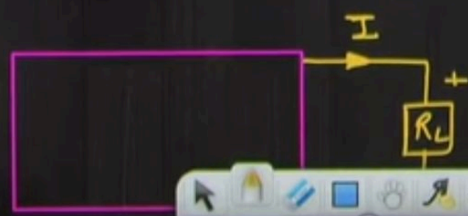
12:08

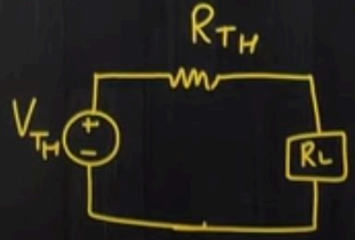
Thevenin's Theorem.

Any linear, bilateral two terminal network consisting of sources and resistors (Impedance) can be replaced by an equivalent circuit consisting of voltage source in series with resistance.

Voltage source is represented by V_{TH}.

Current source is represent by R_{TH}.



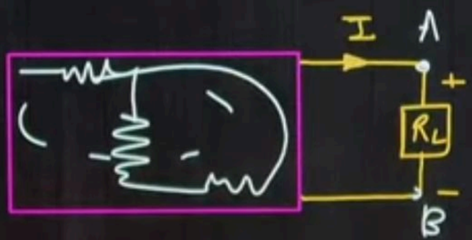


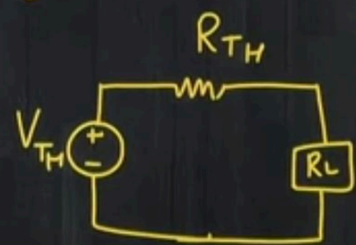
12:10

an equivalent circuit consisting of voltage source in series with resistance.

Voltage source is represented by V_{TH}.

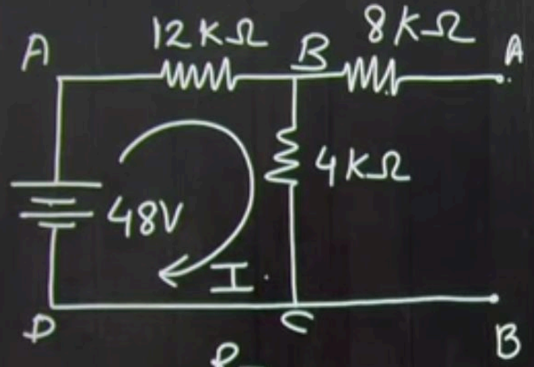
Current source is represent by R_{TH}.





12:14

Calculate V_{TH}, R_{TH} and load current through $\underline{AB}$.



① Calculate V_{TH}.

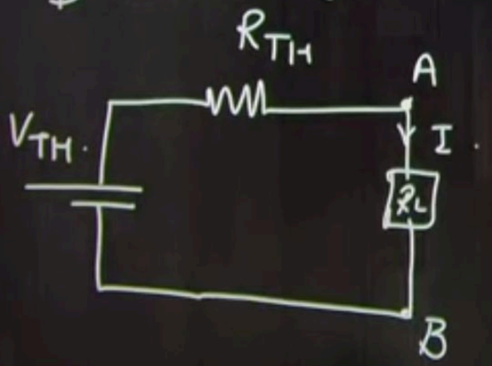
Apply KVL to mesh ABCDA:

$$+48 - 12I - 4I = 0$$

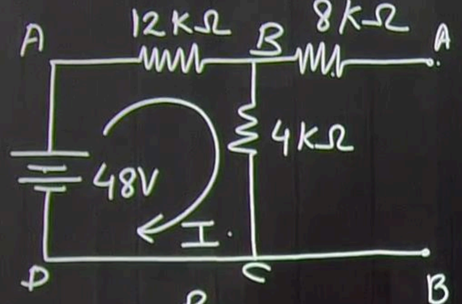
$$48 - 16I = 0$$

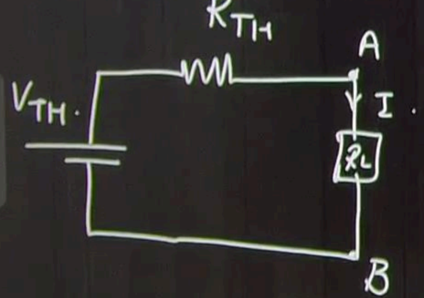
$$48 = 16I$$

$$\boxed{I = 3A}$$



Calculate V_{TH}, R_{TH} and load current through AB.





① Calculate V_{TH}.

Apply KVL to mesh ABCDA.

$$+48 - 12I - 4I = 0$$

$$48 - 16I = 0$$

$$48 = 16I$$

$$\boxed{I = 3A}$$

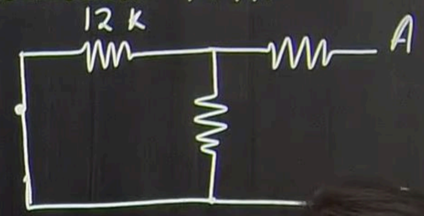
$$V_{4\Omega} = I \times R$$

$$= 3 \times 4$$

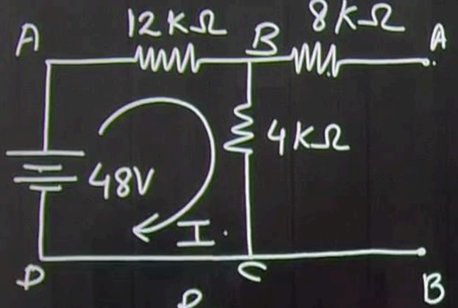
$$V_{4\Omega} = 12V$$

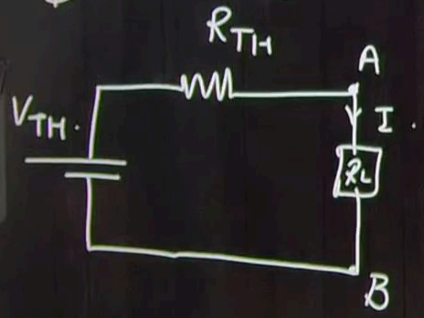
$$V_{TH} = 12\ KV$$

② Calculate R_{TH}.



Calculate V_{TH}, R_{TH} and load current through AB.





① Calculate V_{TH}.

Apply KVL to mesh ABCDA.

$$+48 - 12I - 4I = 0$$

$$48 - 16I = 0$$

$$48 = 16I$$

$$\boxed{I = 3A}.$$

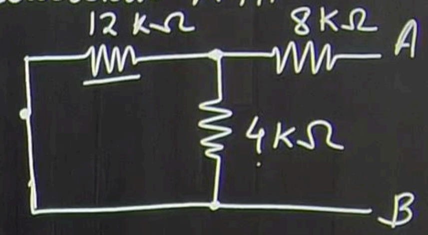
$$V_{4\Omega} = I \times R$$

$$= 3 \times 4$$

$$V_{4\Omega} = 12V.$$

$$V_{TH} = 12\,KV$$

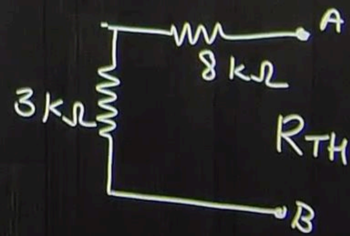
② Calculate R_{TH}.



Here $12\Omega \parallel 4\Omega$.

$$\frac{1}{R_P} = \frac{1}{12} + \frac{1}{4}$$

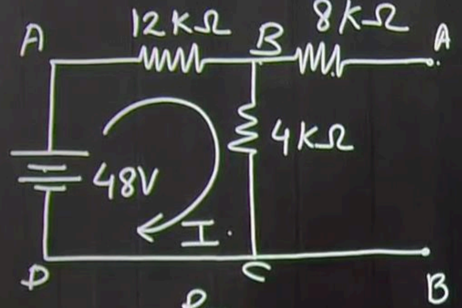
$$R_P = 3\,K\Omega.$$

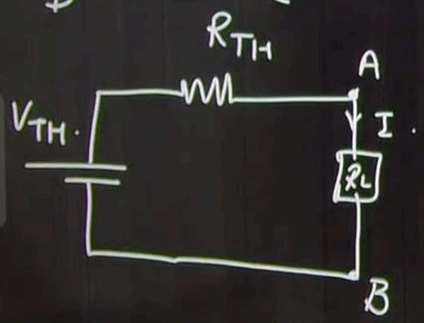


$$R_{TH} = 3 + 8$$

$$= 11K\Omega$$

Calculate V_{TH}, R_{TH} and load current through AB.





① Calculate V_{TH}.

Apply KVL to mesh ABCDA.

$$+48 - 12I - 4I = 0$$

$$48 - 16I = 0$$

$$48 = 16I$$

$$\boxed{I = 3A}$$

$$V_{4\Omega} = I \times R$$

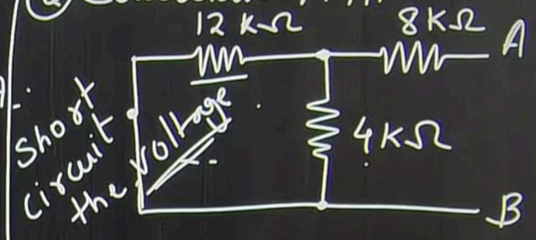
$$= 3 \times 4$$

$$V_{4\Omega} = 12V$$

$$V_{TH} = 12\,kV$$

$$I = \frac{V_{TH}}{R_{TH}} = \frac{12\,kV}{11\,k\Omega} = 1.09A$$

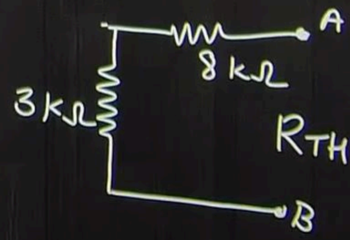
② Calculate R_{TH}.



Here $12\Omega \parallel 4\Omega$.

$$\frac{1}{R_P} = \frac{1}{12} + \frac{1}{4}$$

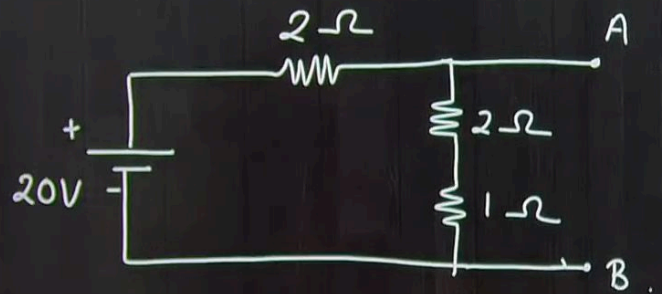
$$R_P = 3\,k\Omega$$



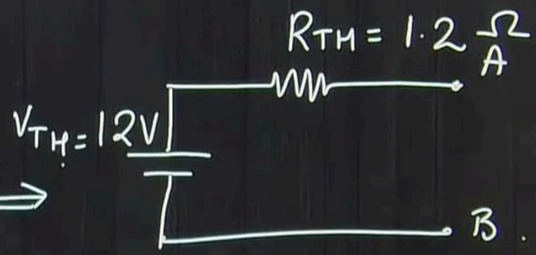
$$R_{TH} = 3 + 8$$

$$= 11\,k\Omega$$

Calculate V_{TH} & R_{TH} of following circuit across AB



$\Longrightarrow$

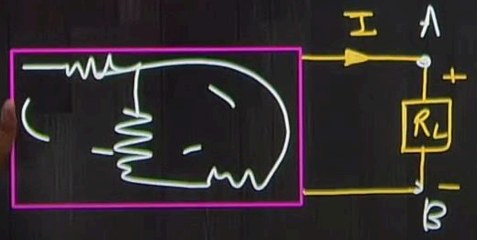


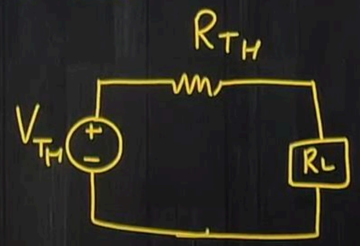
12:38

Any linear, bilateral two terminal network consisting of sources and resistors (Impedance) can be replaced by an equivalent circuit consisting of voltage source in series with resistance.

Voltage source is represented by V_{TH}.

Resistance ~~Current source~~ is represent by R_{TH}.



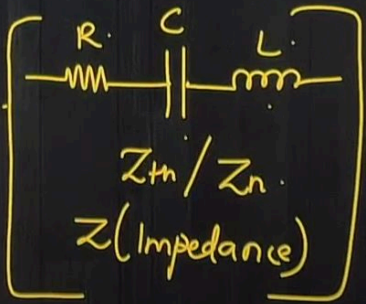


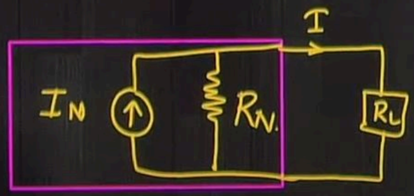
Norton's theorem.

Any linear, bilateral two terminal network consisting of sources & resistors (Impedance) can be replaced by an equivalent circuit consisting current source in parallel with a resistance

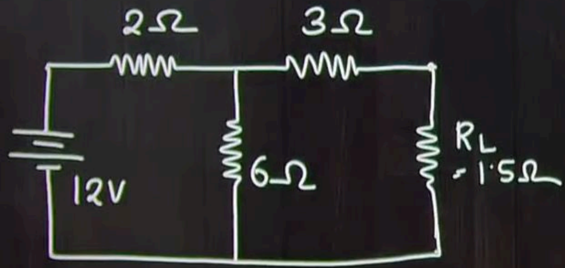
Current source is represented by I_N

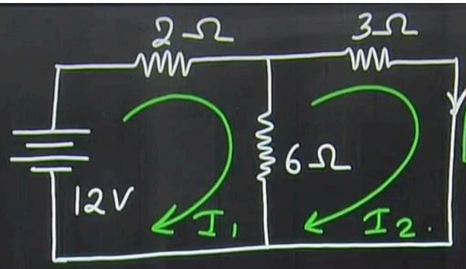
Resistance is represented by $(R_{TH})(R_N)$.





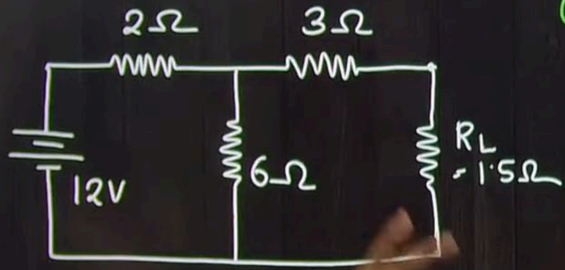
Find the current through the Resistance R_L of circuit. Use Norton's equivalent circuit.

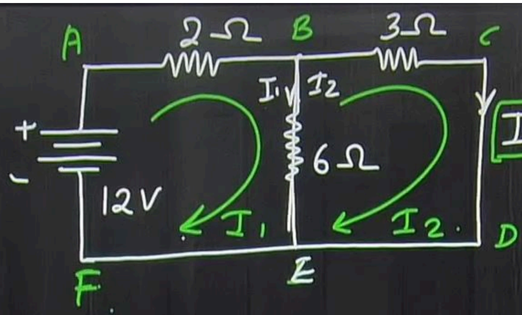




$\boxed{I_N = I_2}$

Find the current through the Resistance R_L of circuit. Use Norton's equivalent circuit.





$\boxed{I_N = I_2}$

① Calculate current I_N.

Apply KVL to mesh ABEFA

$$+12 - 2(I_1) - 6(I_1 - I_2) = 0$$

$$12 - 2I_1 - 6I_1 + 6I_2 = 0$$

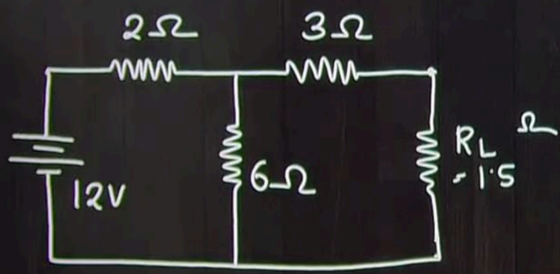
$$\boxed{-8I_1 + 6I_2 = -12 \quad \text{— ①}}$$

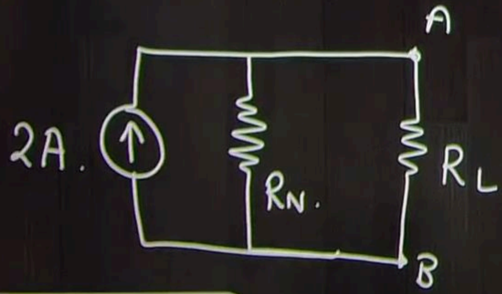
Apply KVL to mesh BCDE.

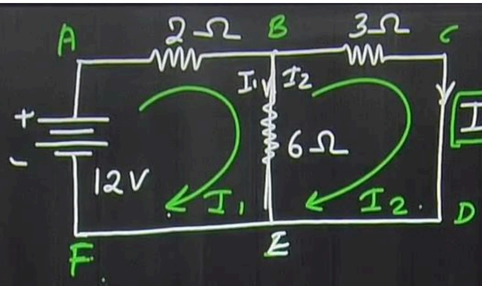
$$-6(I_2 - I_1) - 3I_2 = 0$$

$$\boxed{6I_1 - 9I_2 = 0 \quad \text{— ②}}$$

Find the current through the Resistance R_L of circuit. Use Norton's equivalent circuit.







$\boxed{I_N = I_2}$

① Calculate current I_N.

Apply KVL to mesh ABEFA

$$+12 - 2(I_1) - 6(I_1 - I_2) = 0$$

$$12 - 2I_1 - 6I_1 + 6I_2 = 0$$

$$\boxed{-8I_1 + 6I_2 = -12 \quad \text{— ①}}$$

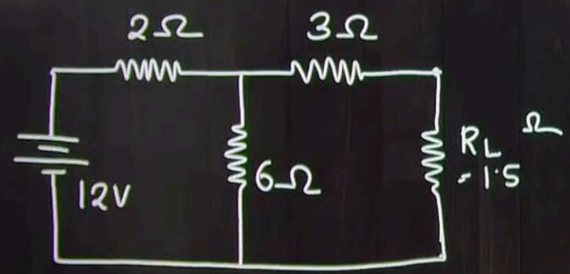
Apply KVL to mesh BCDE.

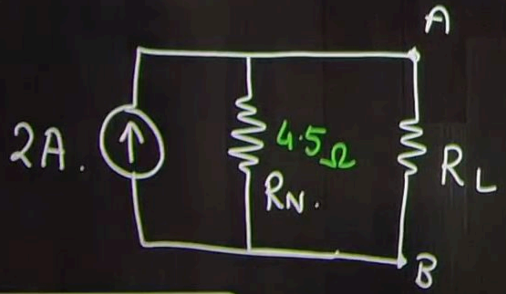
$$-6(I_2 - I_1) - 3I_2 = 0$$

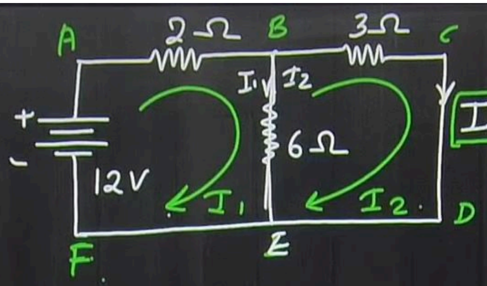
$$\boxed{6I_1 - 9I_2 = 0 \quad \text{— ②}}$$

$x = I_1 = 3A \qquad y = I_2 = 2A$

Find the current through the Resistance R_L of circuit. Use Norton's equivalent circuit.







$\boxed{I_N = I_2}$

(1) Calculate current I_N.

Apply KVL to mesh ABEFA

$$+12 - 2(I_1) - 6(I_1 - I_2) = 0$$

$$12 - 2I_1 - 6I_1 + 6I_2 = 0$$

$$\boxed{-8I_1 + 6I_2 = -12 \quad \text{— (1)}}$$

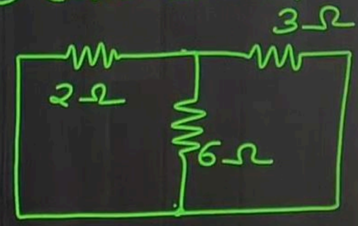
Apply KVL to mesh BCDE.

$$-6(I_2 - I_1) - 3I_2 = 0$$

$$\boxed{6I_1 - 9I_2 = 0 \quad \text{— (2)}}$$

$x = I_1 = 3A \qquad y = I_2 = 2A$

(2) Calculate R_N.



$$2\Omega \| 6\Omega + 3\Omega$$

$$= \left(\frac{1}{2} + \frac{1}{6}\right)^{-1} + 3$$

$$= 4.5\,\Omega$$

$$\boxed{-8I_1 + 6I_2 = -12 \quad — (1)}$$

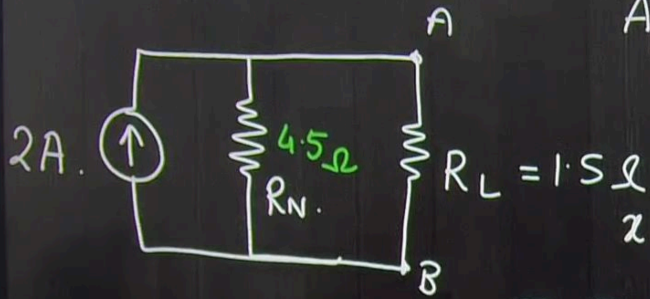
Apply KVL to mesh BCDE.

$$-6(I_2 - I_1) - 3I_2 = 0$$

$$\boxed{6I_1 - 9I_2 = 0 \quad — (2)}$$

$$x = I_1 = 3A \qquad y = I_2 = 2A$$

$$R_N = 4.5\,\Omega$$

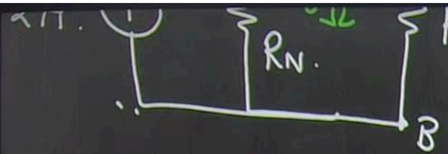


$$V = I \times R_T$$

$$V = I \times (4.5 \,||\, 1.5)$$

$$= 2 \times \left(\left(\frac{1}{4.5} + \frac{1}{1.5} \right)^{-1} \right)$$

$$= 2.25V$$



$R_L = 1.5\,\Omega$

$x = I_1 = 3A \qquad y = I_2 = 2A$

$$V = I \times R_T$$

$$V = I \times (4.5 \parallel 1.5)$$

$$= 2 \times \left(\left(\frac{1}{4.5} + \frac{1}{1.5}\right)^{-1}\right)$$

$$= \underline{2.25V}$$

Since R_L is in parallel to current source.

$$V_{AB} = 2.25V$$

$$I_{AB} = \frac{V_{AB}}{R_L} = \frac{2.25}{1.5} = 1.5A$$