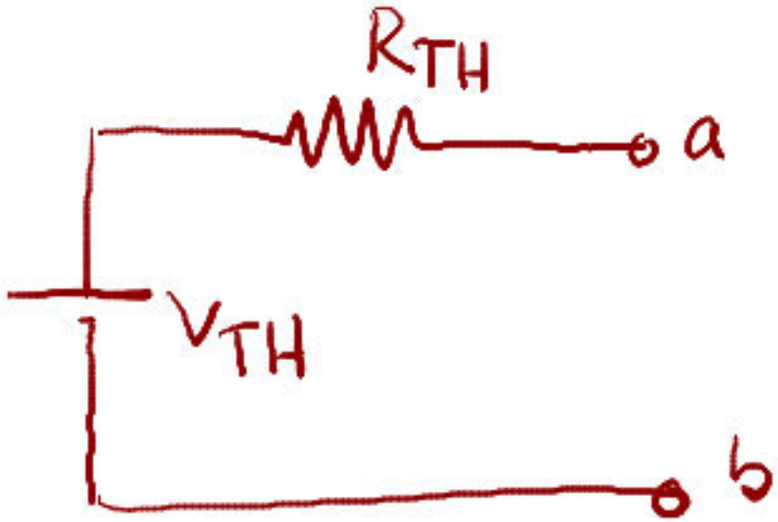
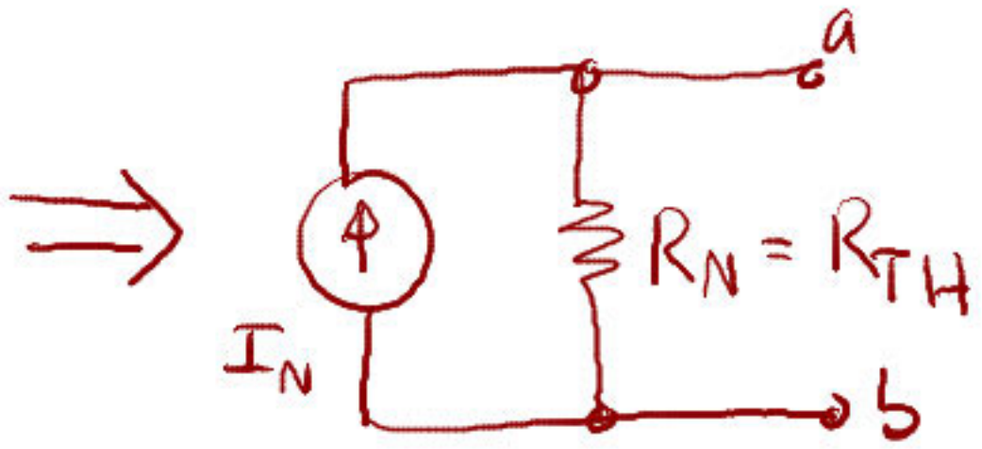
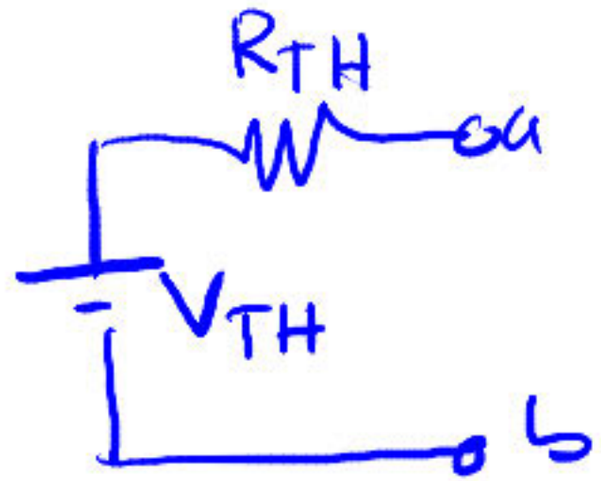
Thevenin to Norton Transformation



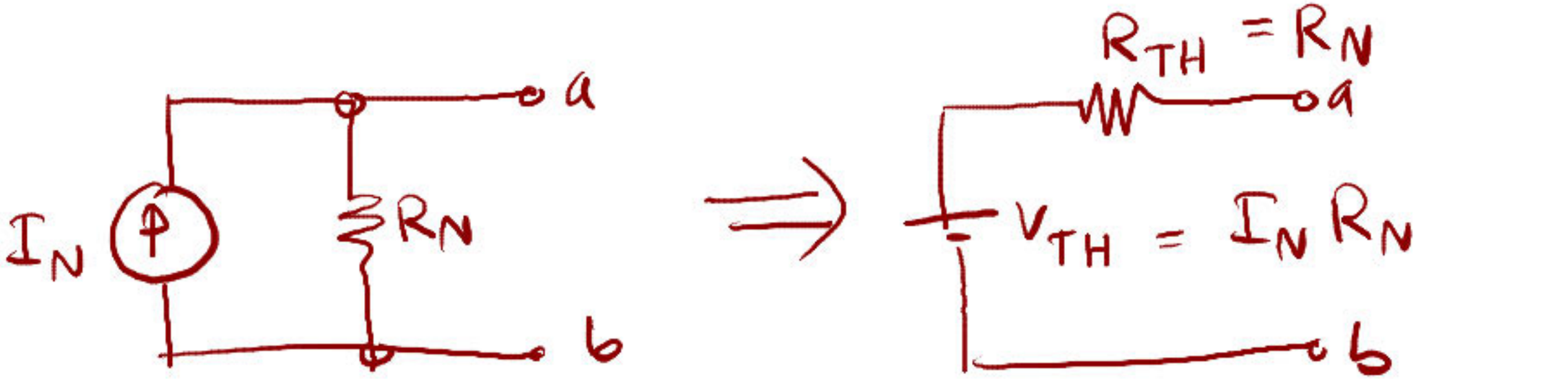


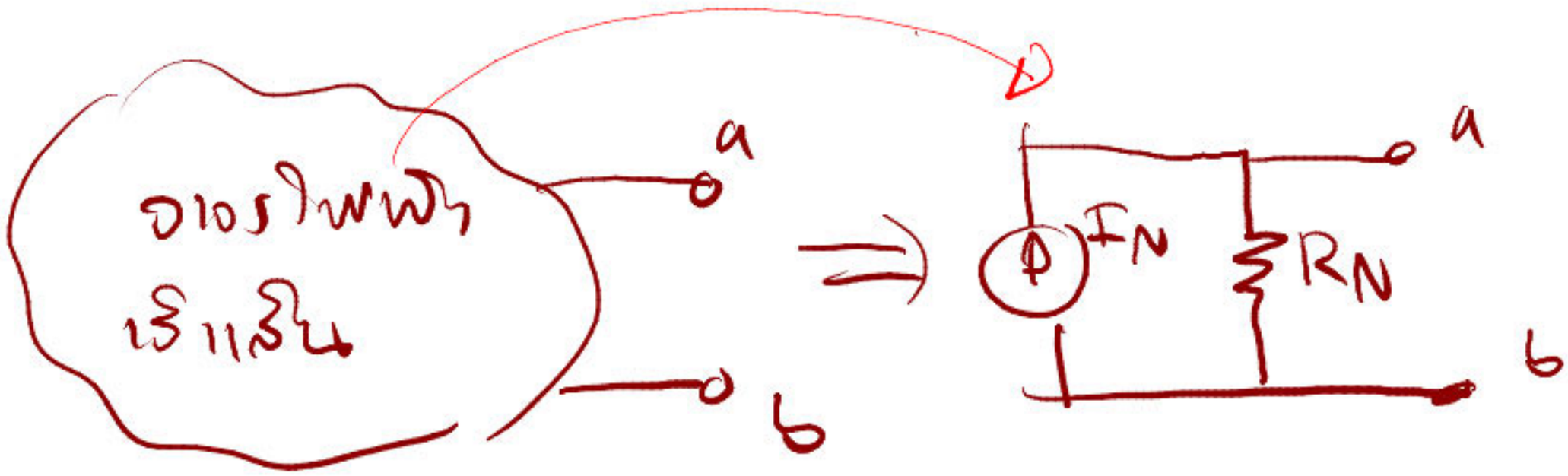
$$I_N = \frac{V_{TH}}{R_{TH}}$$



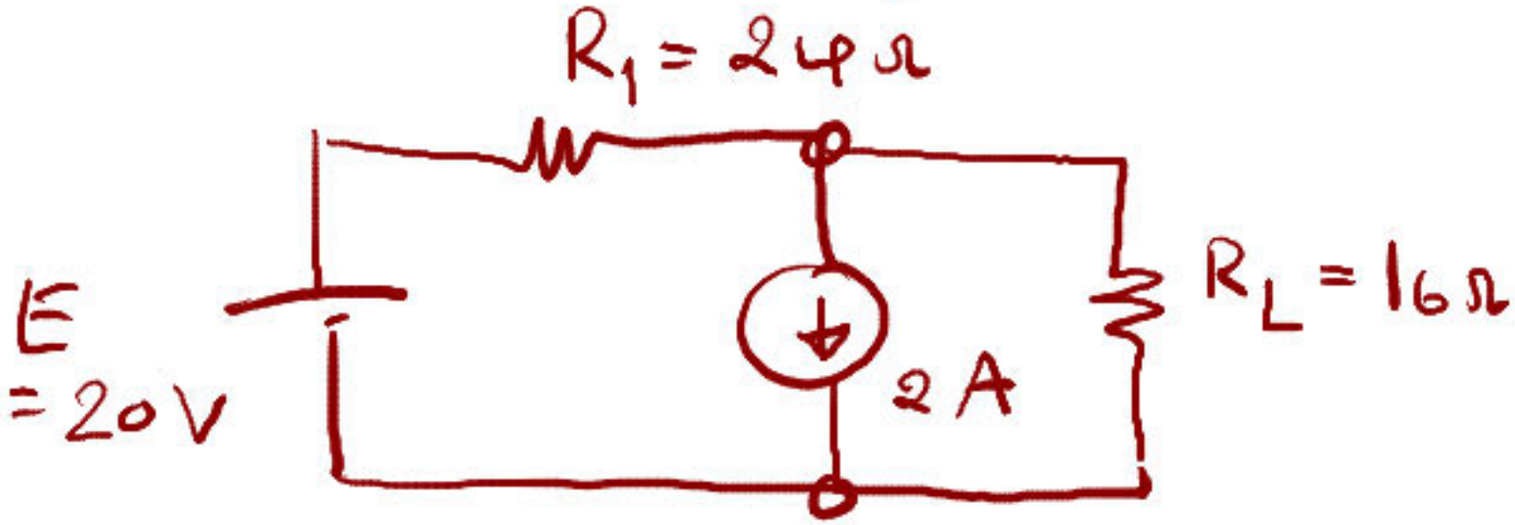
P_{Loss} = กำลังงาน R สูญเสีย (ความร้อน)

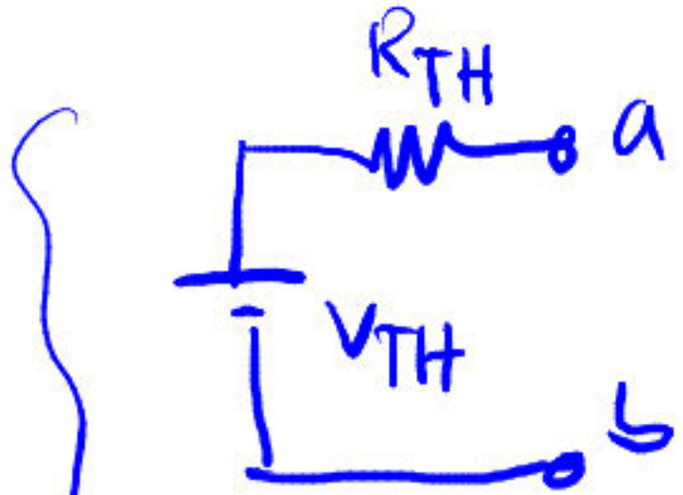
Norton to Thevenin Transformation



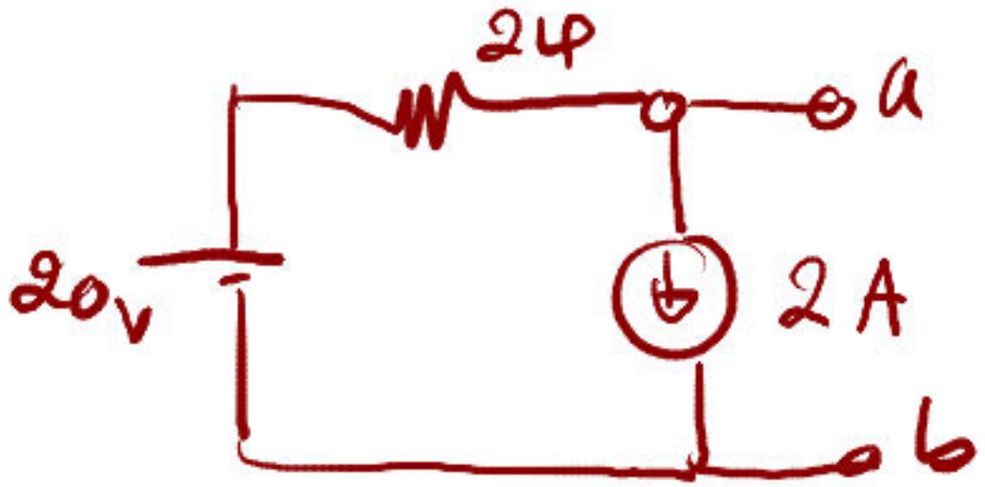


Ex 9 จงหาวงจรสมมูลเทวินิน





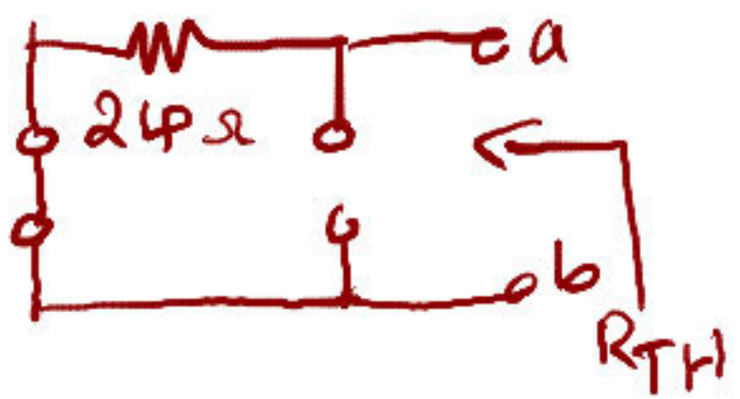
Step ① หา R_L ออก



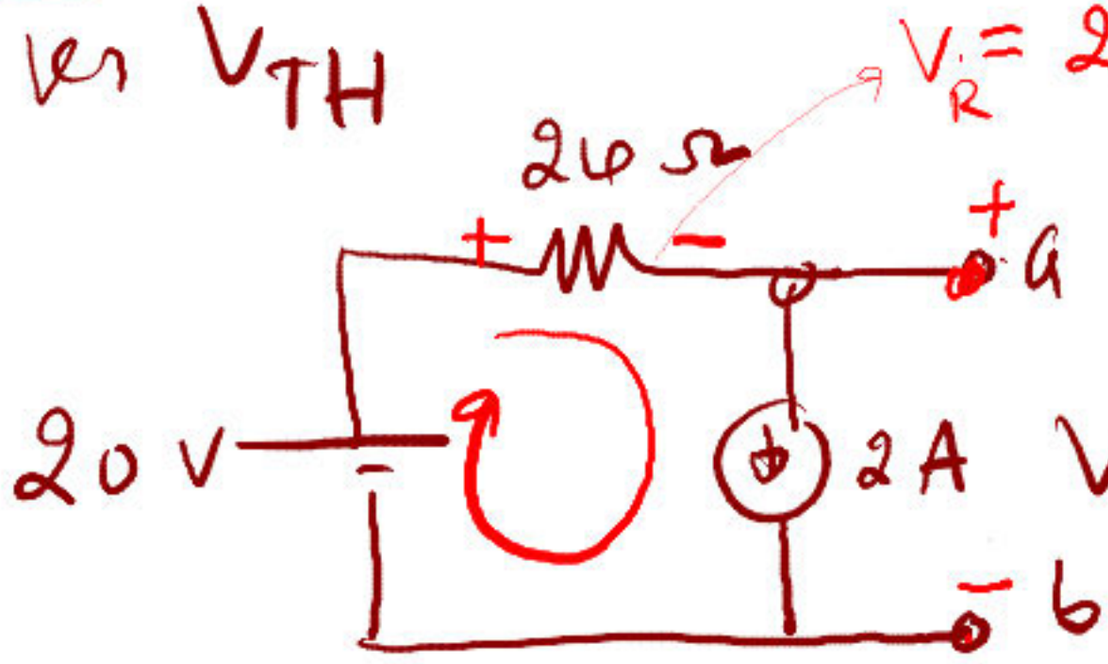
Step ② หา R_{TH} = 24Ω

Voltage Source = Short

Current Source = open



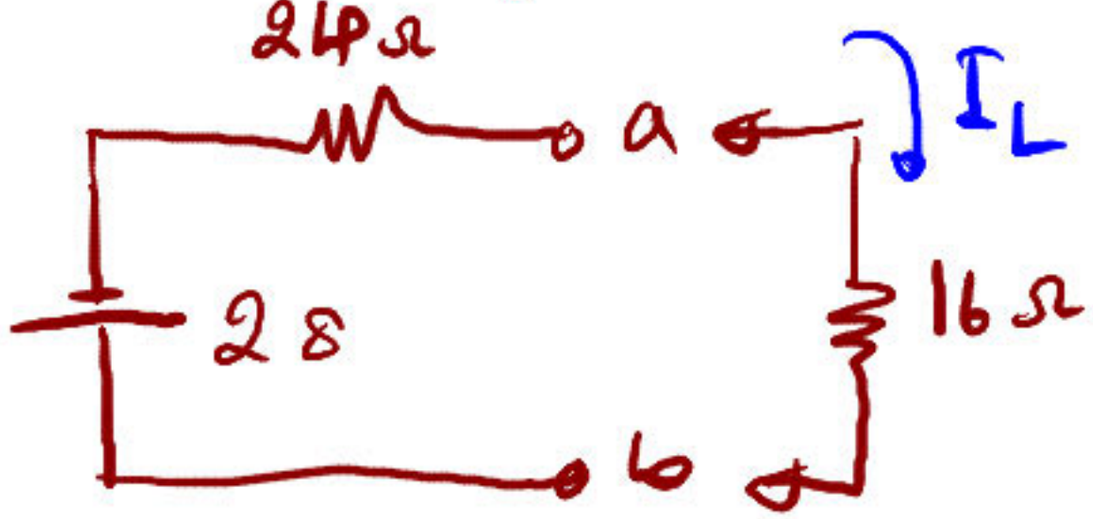
step ③ หา V_{TH}



$V_R = 2 \times 24 = 48$ V

$V_{TH} = -48 + 20 = -28$ V

step ④ เป็นวงรอบปิด



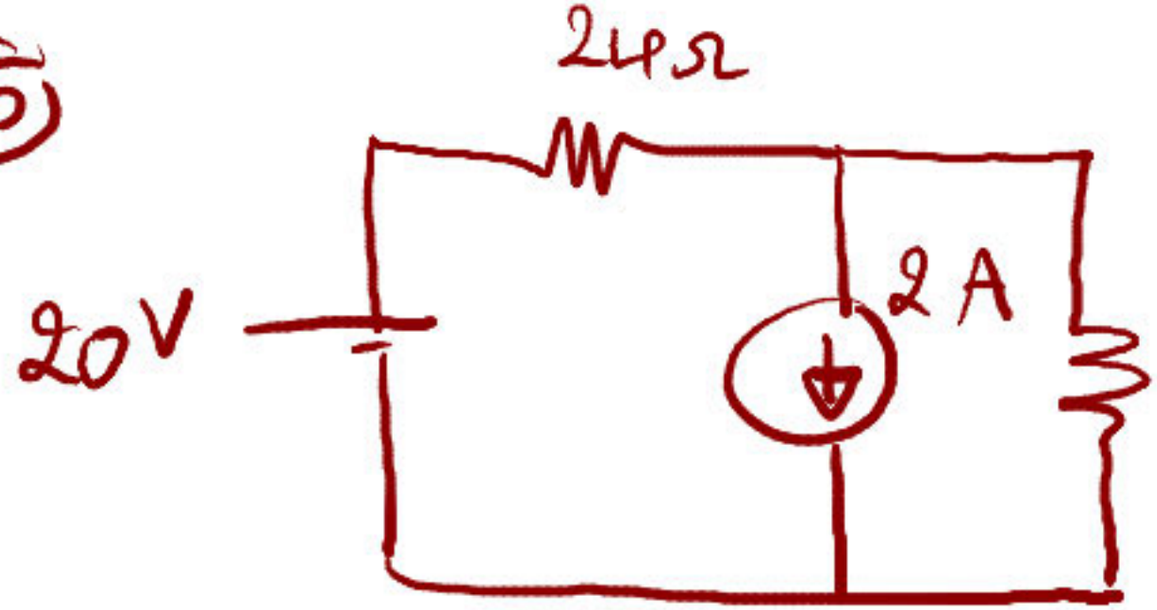
$I_L = \frac{28}{24+16} = \_\_$ A.

$V_L = \frac{28 \times 16}{(24+16)}$

$= \_\_$ Volt.

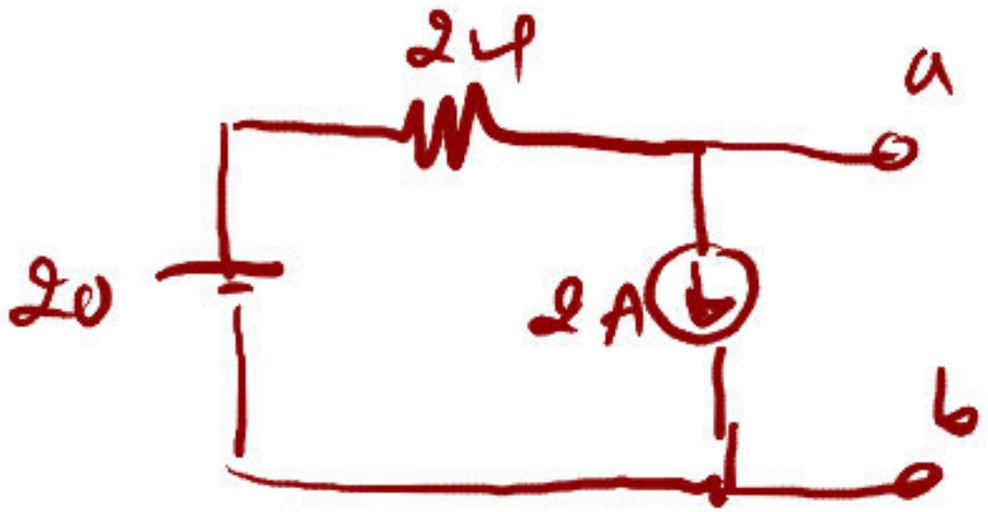
Norton

Ex ⑤

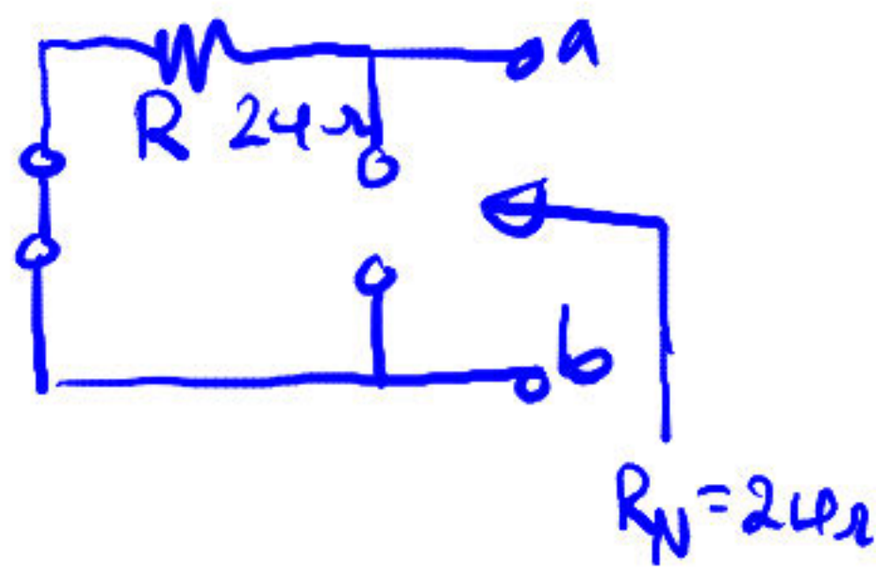


วงจรนี้จงหาค่า
เพรียน

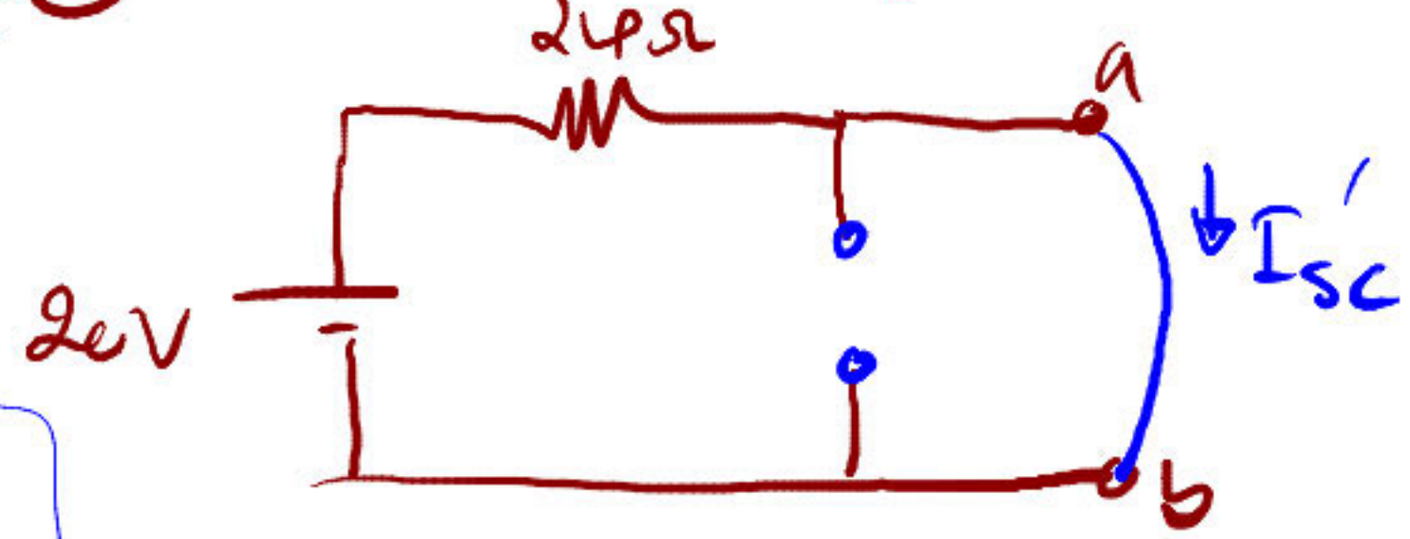
step ① หา R_L ออก



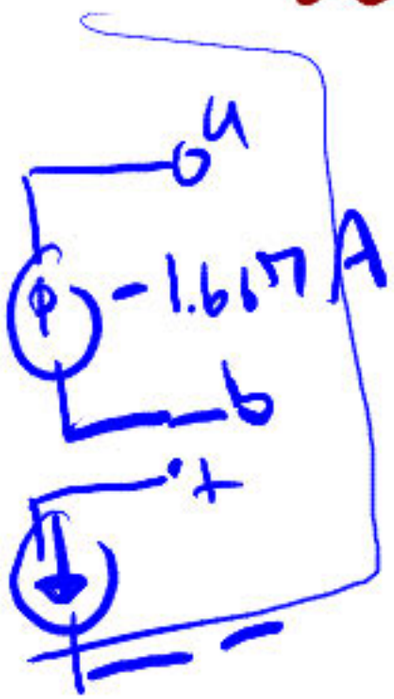
step ② หา R_N



Step③ ให้ลัดวงจร จุด a-b เพื่อหา I_{sc}'

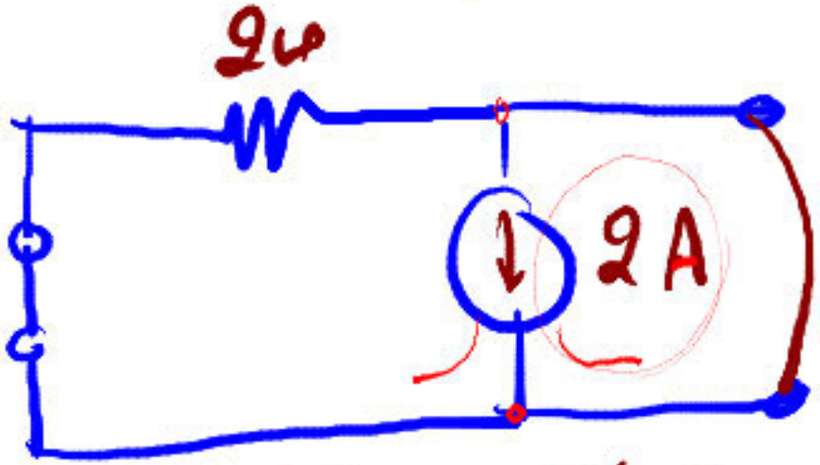


for open I



$$I_{sc}' = \frac{20}{24} = 0.833A$$

I_{sc}'' for short V

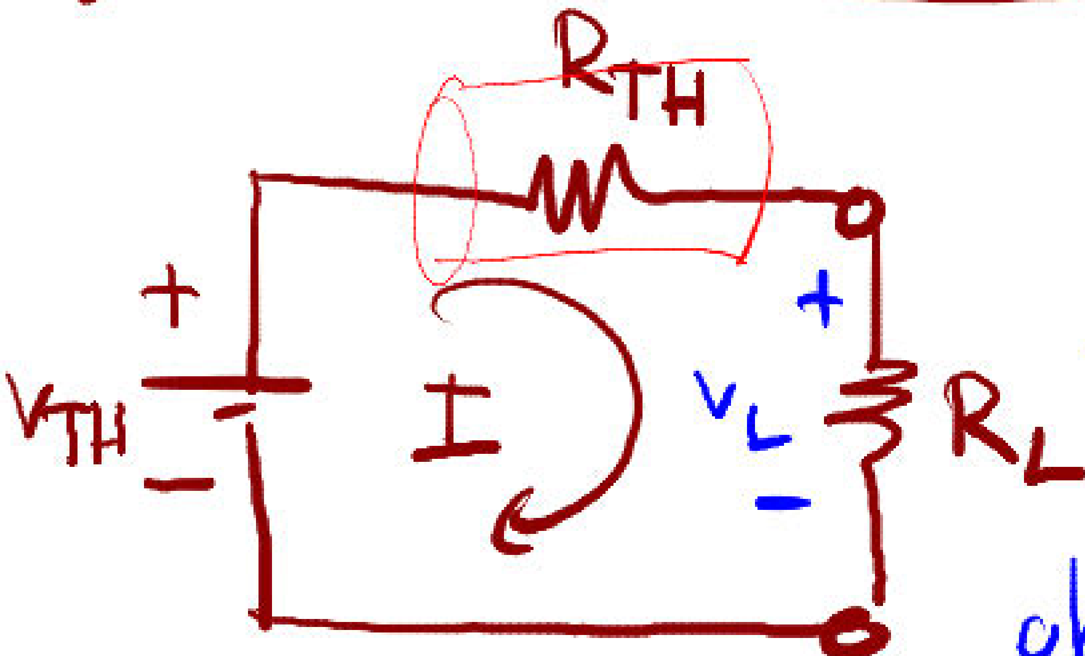


$I_{sc}'' = -2\ A$

Step④

$$I_N = I_{sc}' + I_{sc}'' = 0.833 - 2\ A$$
$$= -1.667\ A$$

Maximum Power Transfer



$\Rightarrow$ (ohm's Law)

$$I = \frac{V_{TH}}{R_{TH}+R_L} \quad \Rightarrow \quad V_L = \frac{V_{TH}}{R_{TH}+R_L}\cdot R_L$$

Power R_L:

① $P_{R_L} = V_L \cdot I$

② $P_{R_L} = V_L^2 / R_L$

③ $P_{R_L} = I^2 \cdot R_L$

} P_{max} When $R_L = R_{TH}$

พิจารณา ①, ②, ③

$$R_{TH} = R_L$$

① $V_L \cdot I = P_{R_L}$

$$\left(\frac{V_{TH}}{R_{TH}+R_L} \cdot R_L\right) \cdot \left(\frac{V_{TH}}{R_{TH}+R_L}\right) = P_{R_L} \Leftrightarrow \frac{V_{TH}^2}{4R_L} \quad \checkmark$$

R_L

$$\text{יות } R_L = R_{TH}$$

② $\frac{V_L^2}{R_L} = P_{R_L}$

$$\frac{\left(\frac{V_{TH}}{R_{TH}+R_L} \cdot R_L\right)^2}{R_L} = P_{R_L} \Leftrightarrow \frac{V_{TH}^2}{4R_L}$$

$R_L = R_H$

(3) $I^2 \cdot R_L = P_{R_L}$

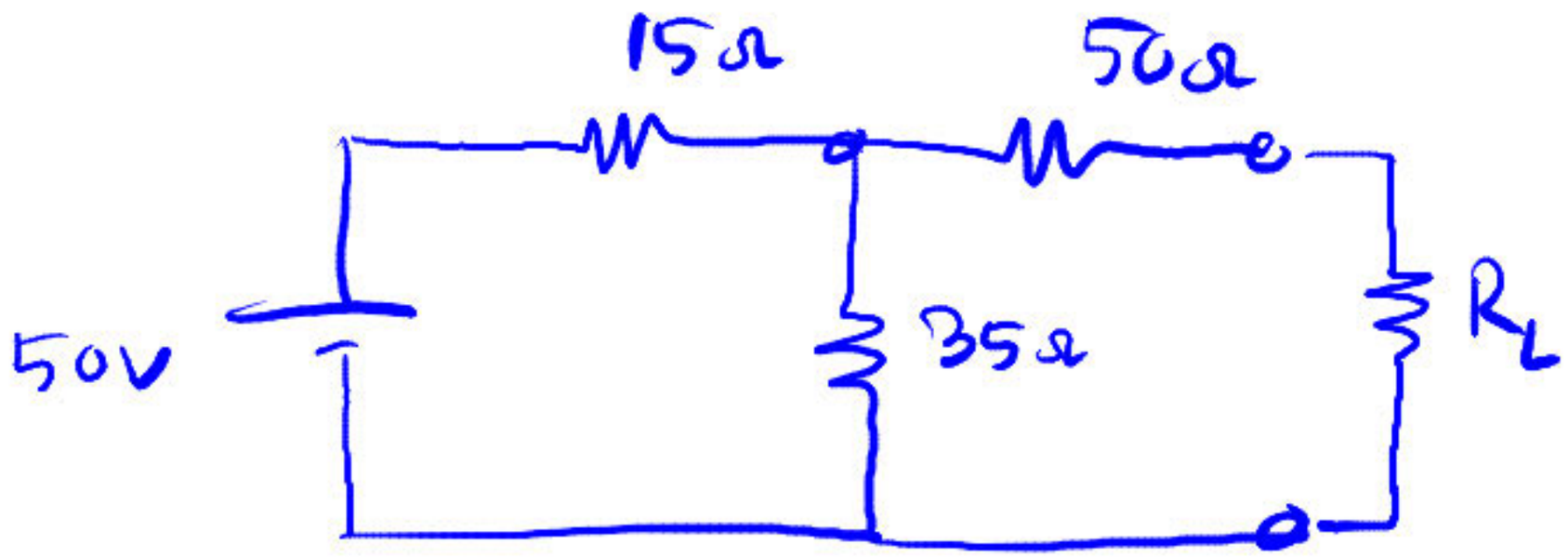
$$\left(\frac{V_{TH}}{R_{TH}+R_L}\right)^2 \cdot R_L = P_{R_L} \Rightarrow \frac{V_{TH}^2}{4R_L}$$

$R_L = R_{TH}$

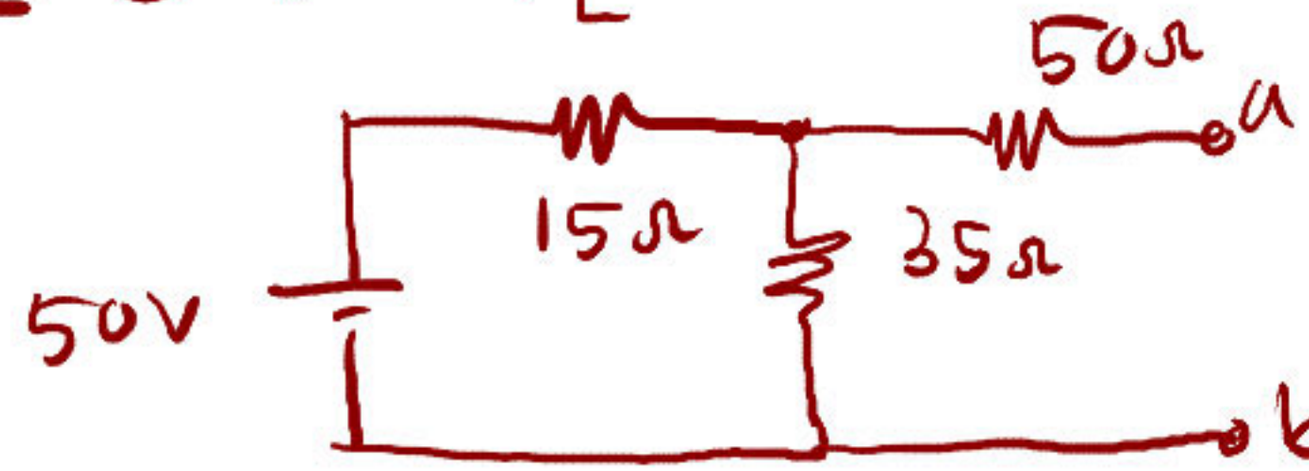
$$\therefore \quad I = \frac{V_{TH}}{2R_{TH}}, \quad V_L = \frac{V_{TH}}{2}, \quad V_{R_{TH}} = \frac{V_{TH}}{2}$$

$$P_{R_L} = \frac{V_{TH}^2}{4R_L}$$

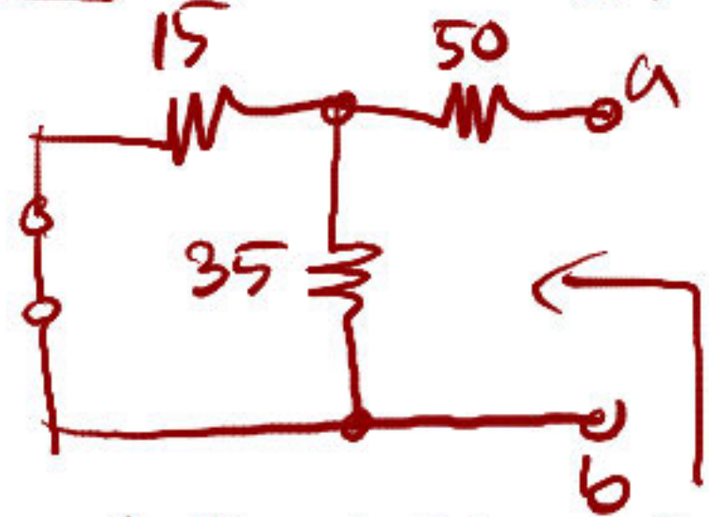
Ex ⑥ จงหา R_L ที่ทำให้ได้รับ พลังงานสูงสุด



Step ① ปลด R_L ออก



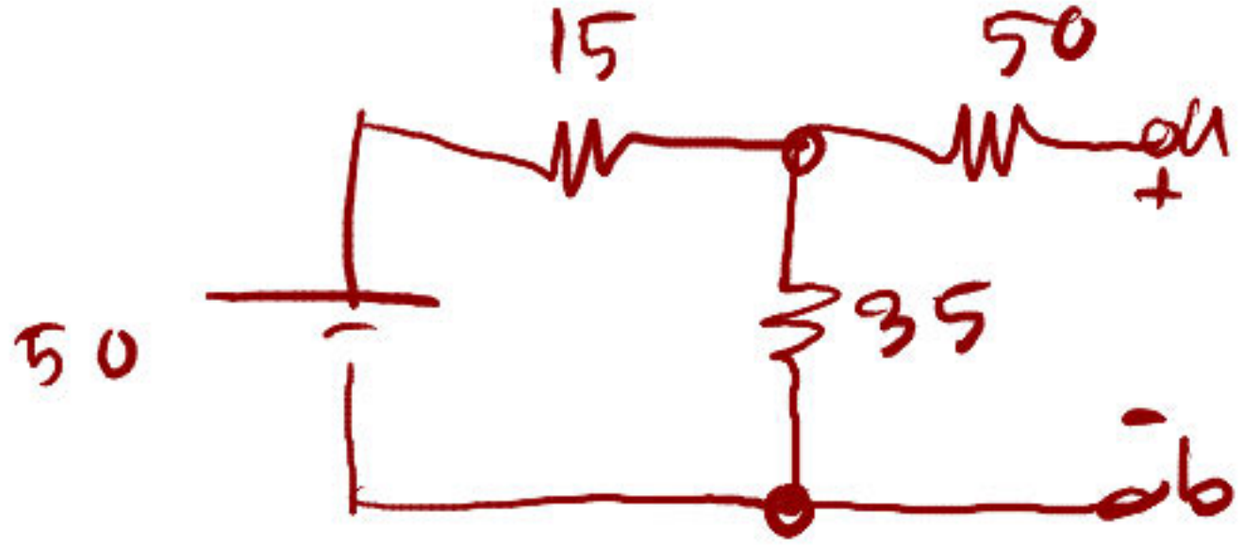
Step ② หา R_{TH}



$R_{TH} = 15//35 + 50$

$= 60.5\ \Omega$

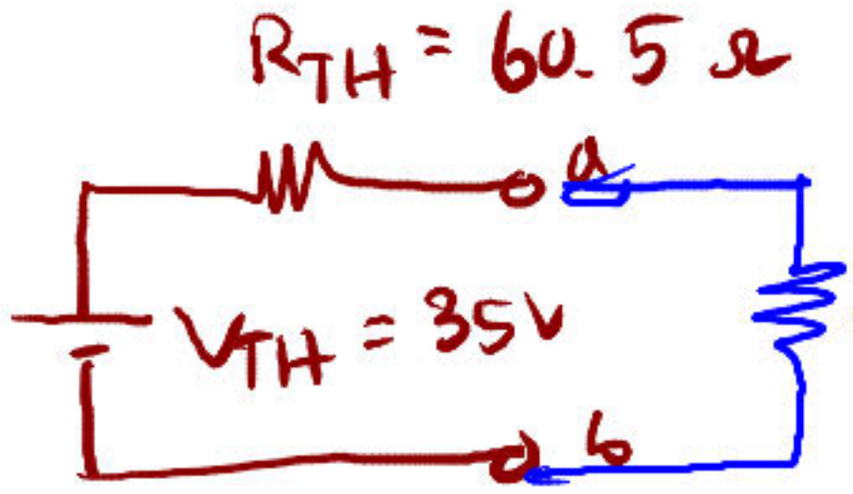
Step ③ $V_{ab} = V_{TH}$



$$V_{TH} = \frac{35}{35+15}(50)$$

$$= 35\ V$$

Step ④



$R_L = R_{TH} = 60.5$

$$\therefore P_{R_L} = \frac{V_{TH}^2}{4R_L} = \frac{35^2}{4(60.5)} = \_\_\_\_\ W$$