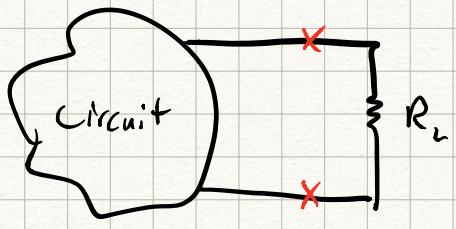
SOURCE TRANSFORMATION



how to find voltage across R ?

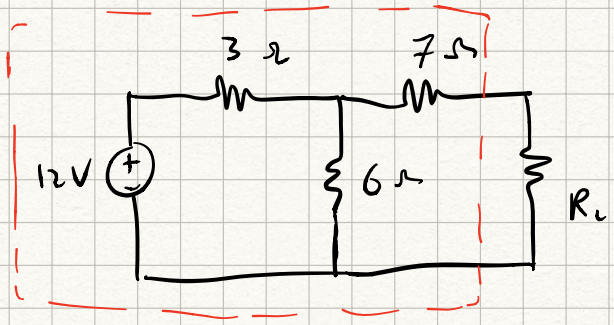
THEVENIN

- we can cut at Xs & replace entire circuit w/

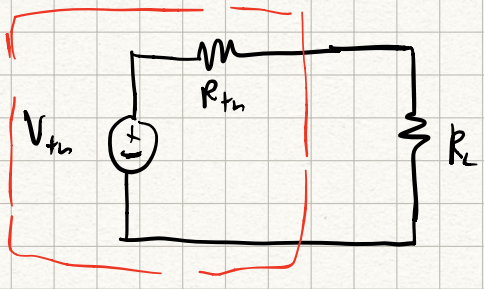
$\Rightarrow V_{th} = V_{oc}$

↑ $V_{open\ circuit}$

$\Rightarrow R_N = R_{th}$

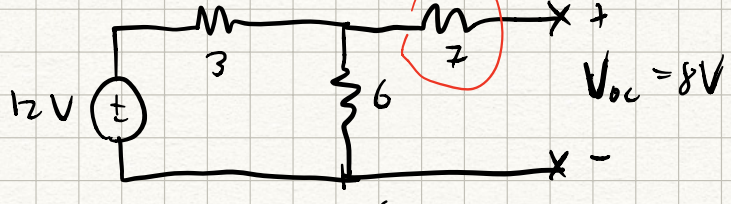


⇒



$V_{th} = V_{oc}$

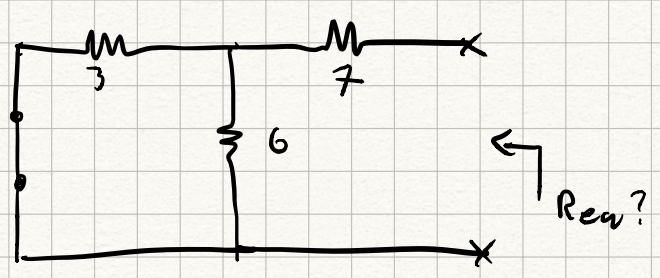
how to find V_{oc} ?



$\therefore V_{oc} = 12\left(\frac{6}{3+6}\right) = 8V$

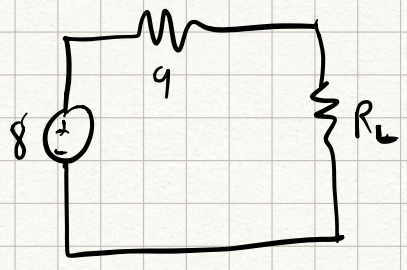
how to find R_{th} ?

⇒ if circuit has <u>only</u> independent sources, kill all sources and find R_{eq}

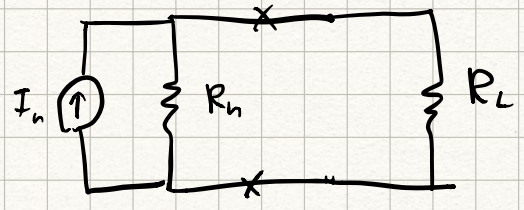


$$R_{eq} = (3 // 6) + 7$$
$$= \left(\frac{6 \cdot 3}{6+3}\right) + 7$$
$$= 9\ \Omega$$

thus, the equivalent circuit is...



NORTON



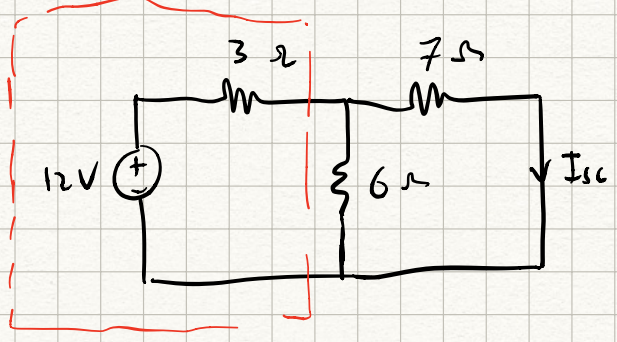
$$\Rightarrow I_N = I_{sc}$$

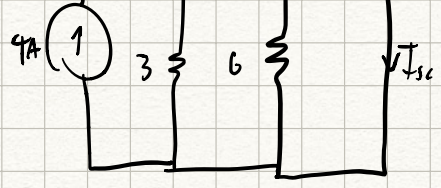
↑ $I_{short\ circuit}$

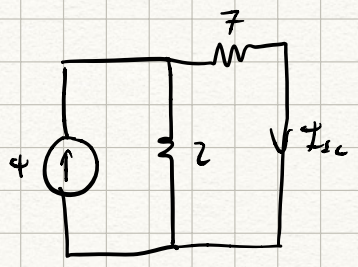
$$\Rightarrow R_N = R_{TH}$$

how to find I_n?

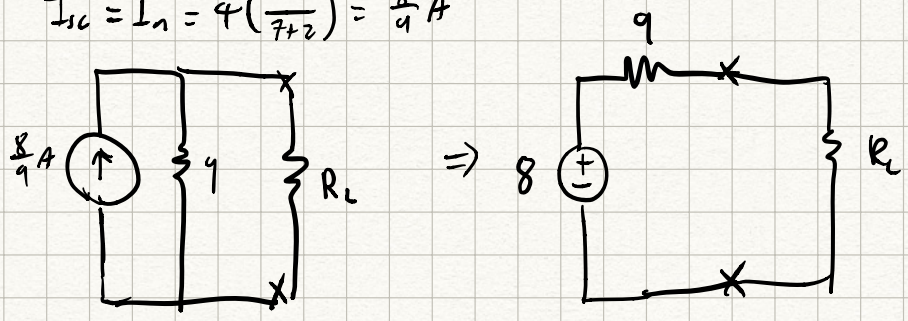
$I_n = I_{short\ circuit}$





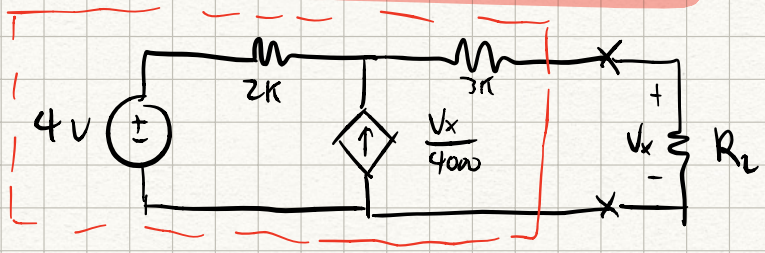


$I_{sc} = I_n = 4\left(\frac{2}{7+2}\right) = \frac{8}{9}A$

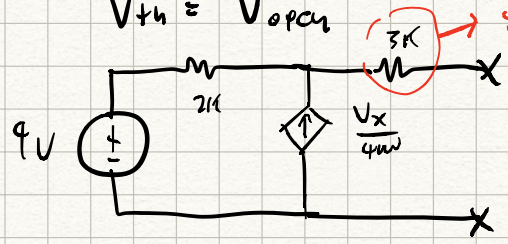


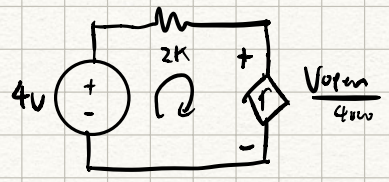
We can convert easily btw. Thevenin & norton!

What if you have independent and dependent sources?



$V_{th} = V_{open}$





this is current ↳ can I high ??? ☺

KVL:

$\frac{V_{open}}{4000} = 2K\left(\frac{V_{open}}{4000}\right) + 4$

$\frac{-1999}{4000}(V_{open}) = 4$

$V_{open} = \frac{16K}{-1999} = -8\ V$

$4 = 2K i + V_{open}$

$4 = 2k\left(\frac{-V_{oc}}{4000}\right) + V_{oc}$

careful

direction!

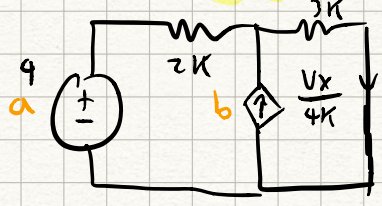
$$4 = -\frac{1}{2} V_{oc} + V_{oc}$$

$$4 = \frac{1}{2} V_{oc}$$

$$8V = V_{oc}$$

R_{th} ?

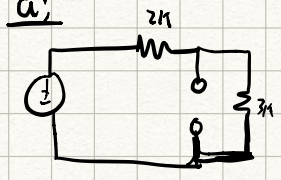
$$R_{th} = R_N = \frac{V_{oc}}{I_{sc}}$$



$V_x = 0$, by inspection

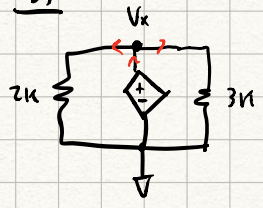
Super position!

a'



$$I_{sc} = \frac{4}{5K} = \frac{1}{1250} A$$

b'



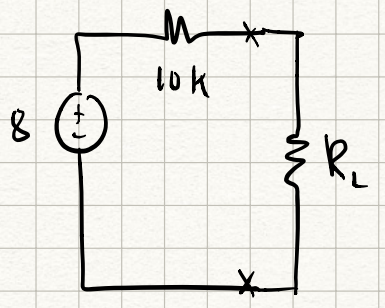
$$\frac{V_x}{4K} = \frac{V}{3} + \frac{V}{2}$$

$$\frac{V_x}{4K} = \frac{V_x}{3} + \frac{V_x}{2}$$

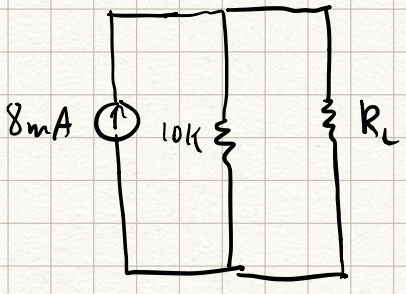
$$\Rightarrow V_x = 0$$

$$\therefore I_{sc} = \frac{1}{1250} A$$

$$R_{th} = R_N = \frac{V_{oc}}{I_{sc}} = 8(1250) = 10K\,\Omega$$



Thevenin



Norton