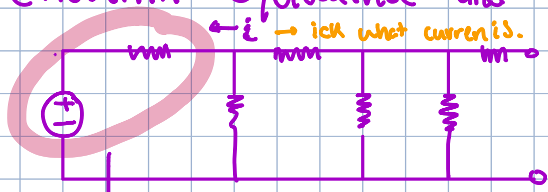
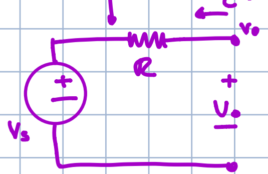
Thevenin Equivalence and norton → SOURCE TRANSFORMATION



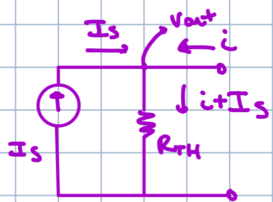
$\leftarrow i$ → idk what current is.

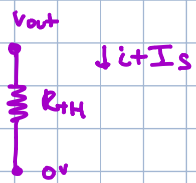


→ we don't know what i is okay!

$V_o = V_s + i * R_{TH}$

↳ voltage when current changes.





$V_{out} = R_{TH} * (i + I_s)$

$= \underline{\underline{R_{TH} * i + R_{TH} * I_s}}$

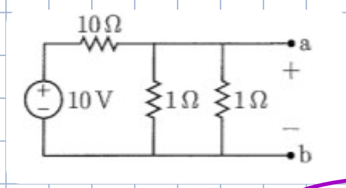
$V_o = i(R_{TH}) + V_s$

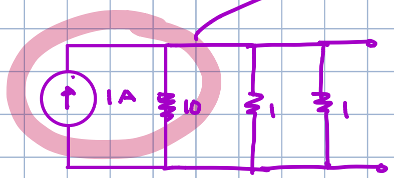
$V_o = i(R_{TH}) + R_{TH} * I_s$

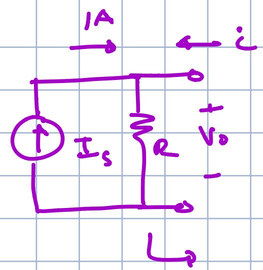
$\therefore V_s = R_{TH} * I_s$

Thevenin and Norton

1.

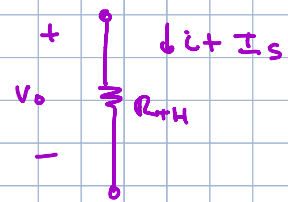






$\frac{1}{10} + \frac{10}{10} + \frac{10}{10} = \frac{1}{R}$

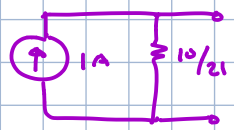
$R_{TH} = 10/21$



$V_o = R_{TH}(i + I_s)$

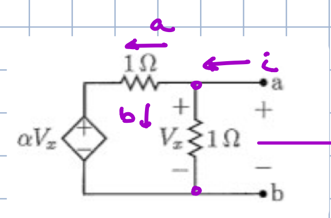
$V_o = R_{TH}\, i + R_{TH} * I_s$

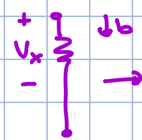
i test



$\boxed{\text{Norton current} = 1A \quad R_{TH} = 10/21\ \Omega}$

2.





$\rightarrow V_x = b * R$ (1Ω)

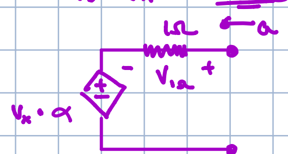
$= b$

(Hint: answer is in terms of α)

↳ boi, that's not really a hint !!

$i = a + b$

$V_o = V_x \rightarrow \underline{V_o = b} \rightarrow V_o = b$



$V_o = a \cdot 1 + V_x \alpha$

$V_o = a + V_o \cdot \alpha$

$\underline{V_o(1-\alpha) = a} \rightarrow V_o(1-\alpha) = a$

$i = a + b$

$i = V_o(1-\alpha) + V_o$

$i = V_o(1-\alpha+1)$

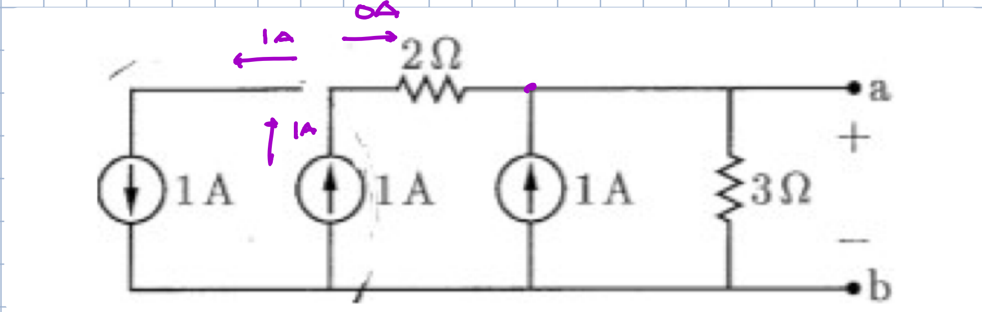
$i = V_o(2-\alpha)$

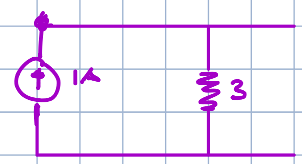
$V_o = \frac{1}{(2-\alpha)} * i$

↳ $\boxed{R_{TH} = \frac{1}{2-\alpha}}$

3.

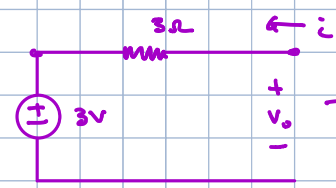
WoW, 0 Amps!





$V_o = 3 * 1$

$R_{TH} = 3$



$\rightarrow V_o = 3i + 3$

4. * I call this move the Patrick Mahones, because

YOU DON'T HAVE TO LOOK AT THE

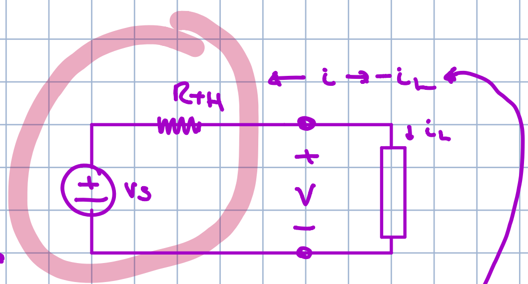
CIRCUIT TO GET THE

RIGHT ANSWER HAHAHA

Sorry, I thought this would make you laugh. Continue studying. !!

$v = 10V$ $\quad i_L = 0A$

$v = -10V$ $\quad i_L = 2A$



reference the circuit as thevenin Equiv.

$V = R_{TH} * i + V_s$

$10 = R_{TH} * (-0) + V_s \rightarrow 10 = V_s$

$-10 = R_{TH} * (-2) + V_s$

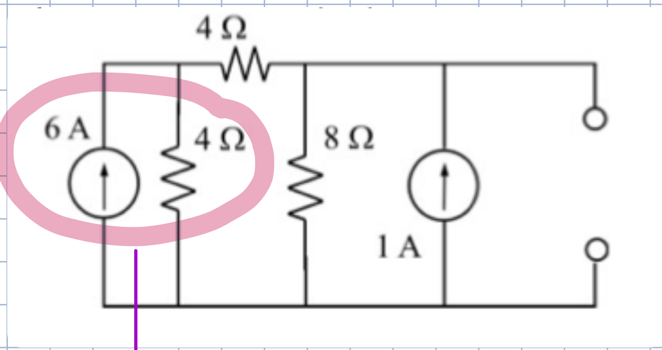
$-10 = R_{TH} * (-2) + 10$

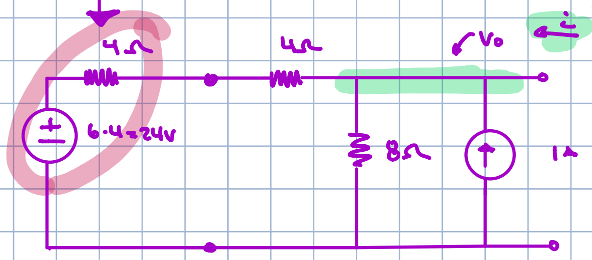
$-20 = R_{TH} * (-2)$

$R_{TH} = -20/-2 = 10Ω$

$\boxed{R_{TH} = 10Ω}$

5.





This is i_{test}

* okay, to be honest, I'm way too lazy to continue, so I'm going to do nodal okay.

→ Also, the goal is to finish asap so...

↳ if you want to learn more, or just use source, come to office hours.

$$\left(\frac{24-V_o}{4+4}+\frac{0-V_o}{8}+1+i=0\right)8$$

$$24-V_o-V_o+8+8i=0$$

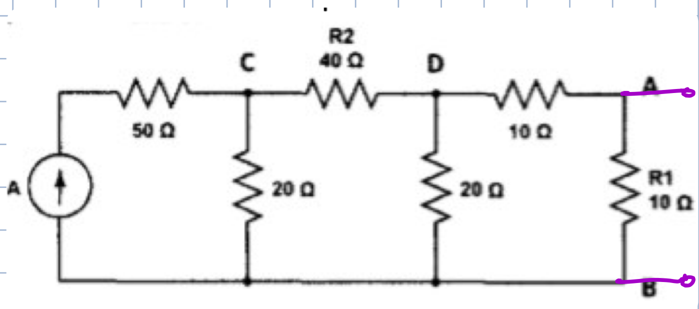
$$-2V_o+32+8i=0$$

$$(32+8i=2V_o)\tfrac{1}{2}$$

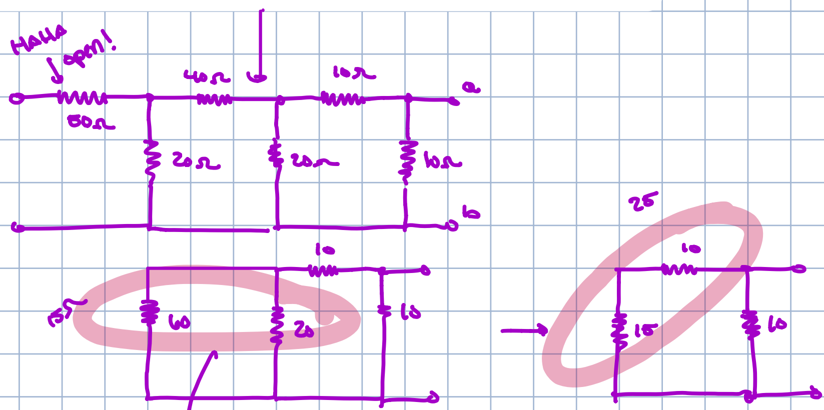
$$16+4i=V_o$$

$$\boxed{\begin{array}{l} V_s=16V \\ R_{TH}=4\Omega \end{array}} \longrightarrow i_a=16/4=4A$$

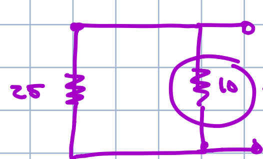
6.



HAHA open!



$$\frac{60\cdot 20}{20+60}=\frac{1200}{80}=\frac{30}{2}=15$$



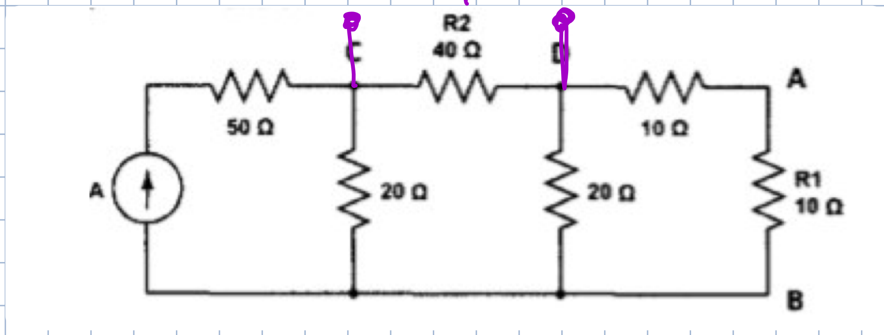
→ OKAY, STOP

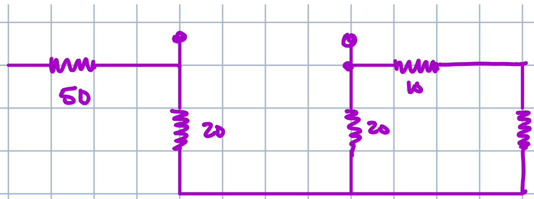
THIS IS THE LOAD

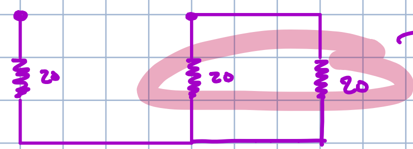
$\boxed{\therefore R_{TH}=25\Omega}$

7.

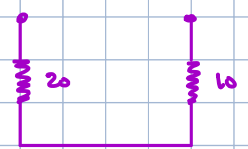
not going to make the same mistake again. I'm going to take it out because it is R_{Load}.





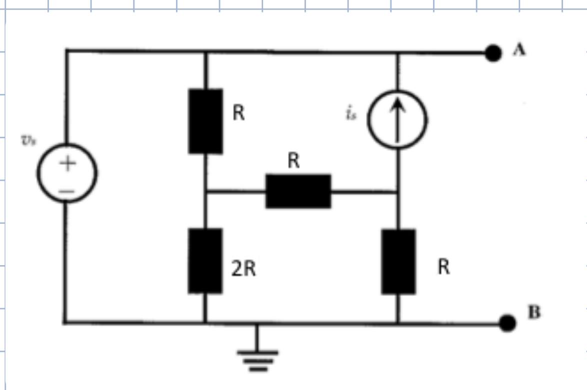


$\frac{20 \cdot 20}{40} = 10\Omega$



$R_{TH} = 20 + 10 = 30\Omega$

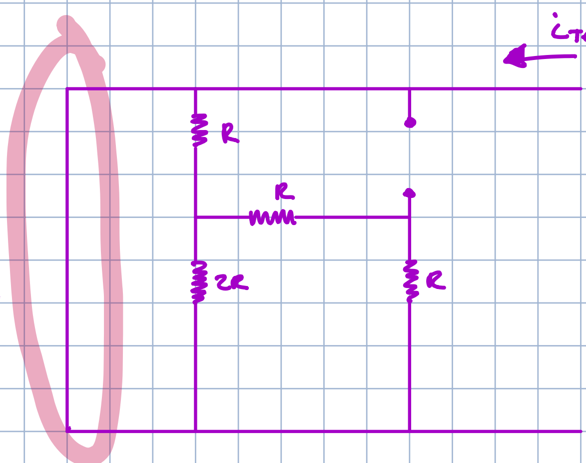
8.



WoW

short circuit

i_{Test}



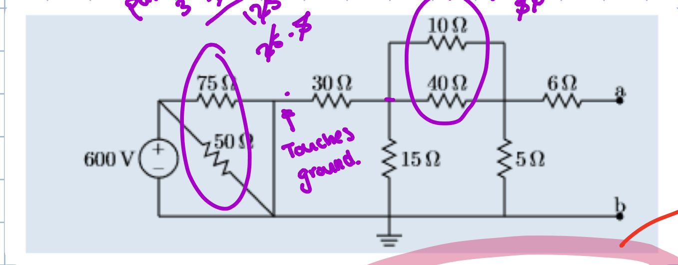
$R_{TH} = 0$

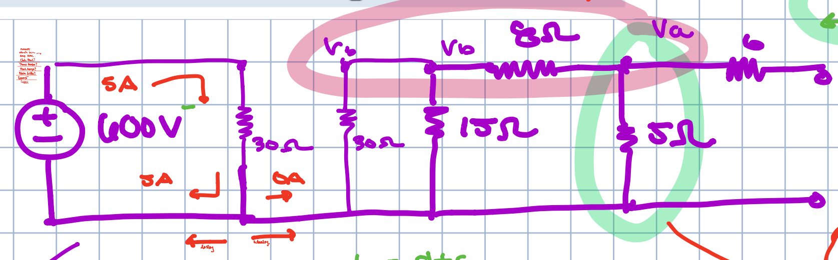
$V_s = 0$

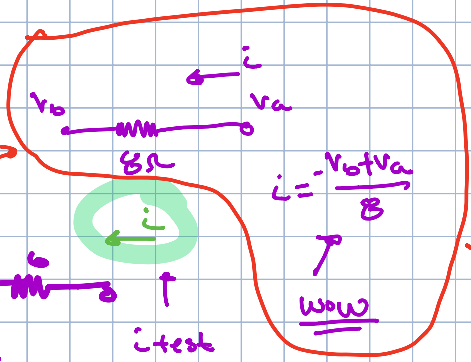
$I_s = -i_{test}$

9.

parallel $\frac{75\cdot 50}{125} = 30\Omega$; $\frac{10\cdot 40}{50} = 8\Omega$

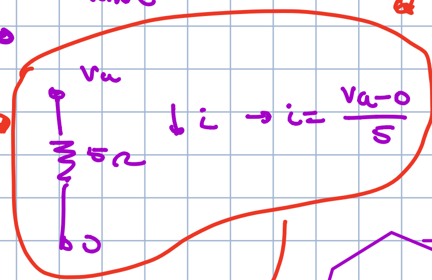






$i = \frac{-V_b + V_a}{8}$

wow



$i = \frac{V_a - 0}{5}$

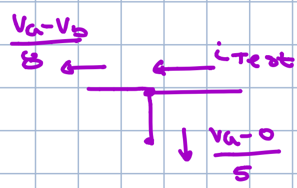
Hey LCTA
→ Do Supernodes??
→ Me→ Anything but source stuff..
→ OK, I got u bro.
→ Thanks man.

OMG !!

$b = a + c$

$$\left(\underbrace{\frac{V_b}{30} + \frac{V_b}{15} + \frac{V_a}{5}}_{\text{current leave}} = \underbrace{i}_{i\,test}\right)30$$

$$i_T = \frac{-V_b + V_a}{8} + \frac{V_a}{5}$$



I'm really hoping this isn't too confusing

$V_b + 2V_b + 6V_a = 30i$

$$\frac{3V_b + 6V_a = 30i}{3}$$

$$i = \frac{-V_b + V_a}{8} + \frac{V_a}{5}$$

$40i = -5V_b + 5V_a + 8V_a$

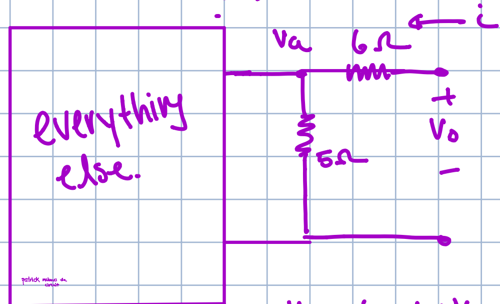
$\underline{40i = -5V_b + 13V_a}$

$\underline{(V_b + 2V_a = 10i)(+5)}$

Two equations

$$\begin{array}{r} 5V_b + 10V_a = 50i \\ -5V_b + 13V_a = 40i \\ \hline 23V_a = 90i \end{array}$$

$V_a = \frac{90}{23} i$



$V_o = 6 * i + V_a$

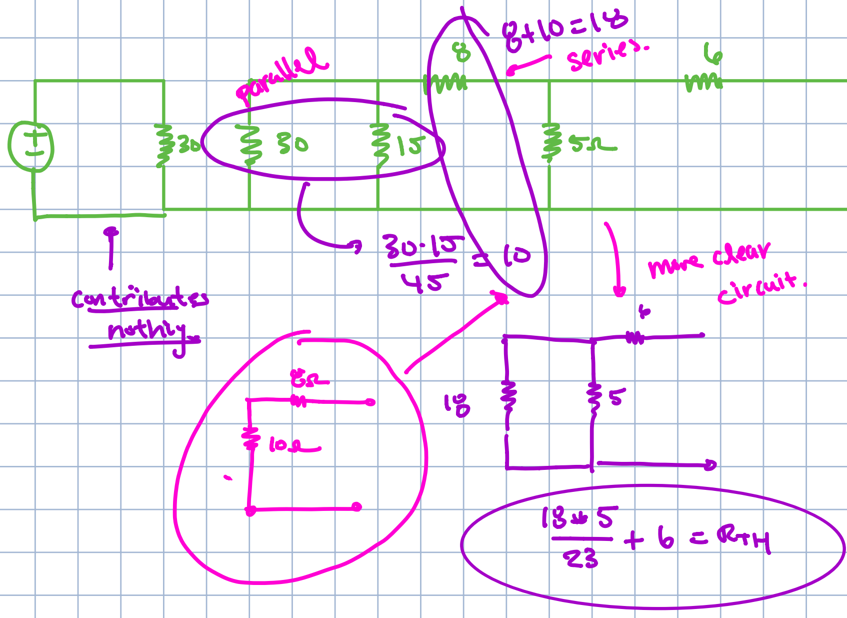
$V_o = 6 * i + \frac{90}{23} i$

$\underline{V_o = 9.913 i}$

↳ $\underline{R_{TH} = 9.913}$

if you understand this, then u are super ready. if not, then look below.

↳ Was that quick? Bro, No. I can go quicker..


parallel
30
30
15
8
6
5Ω
8+10=18
series.
30·15 / 45 = 10
contributes nothing
more clear circuit.
6
8Ω
10Ω
18
5
18·5 / 23 + 6 = R_TH