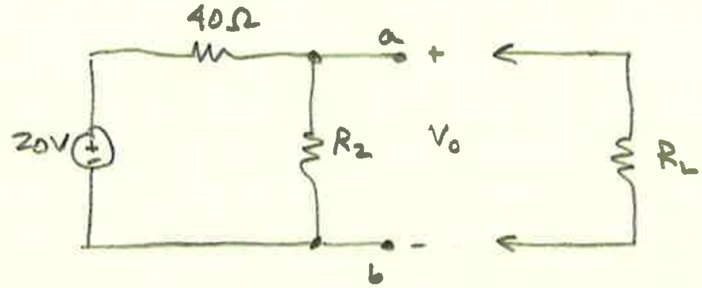
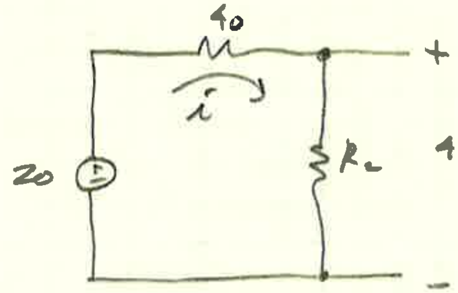
$v_o = 4\,V$ Before R_L is attached.

when R_L is attached, $v_o = 3\,V$



FIND R_L

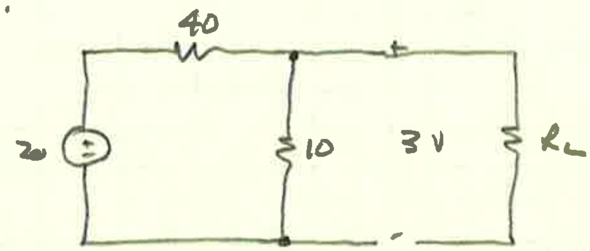
Before R_L is attached, using Voltage Divider Law,



$$4 = \frac{20(R_2)}{40+R_2}$$

$$R_2 = 10\,\Omega$$

Now the circuit Becomes:

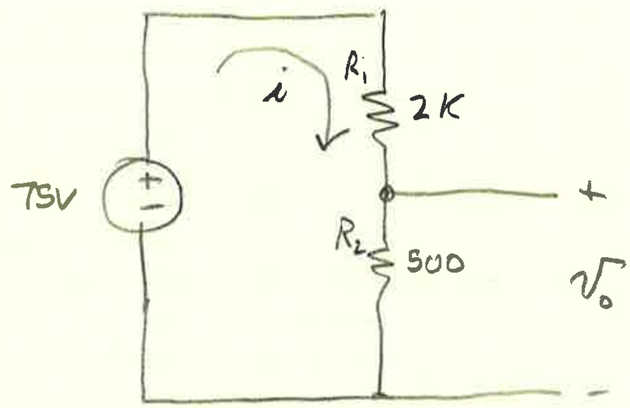


To find R_L:

$$3 = \frac{20(10 \| R_L)}{40+(10 \| R_L)}$$

$$10 \| R_L = \frac{120}{17}$$

$$\frac{10(R_L)}{10+R_L} = \frac{120}{17} \Rightarrow \boxed{R_L = 24\,\Omega}$$



a) Calculate V_o

$$V_o = \frac{75(500)}{500+2000}$$

$$\boxed{V_o = 15V}$$

b) calculate Power in the resistors

$$P_{500} = \frac{V^2}{R} = \frac{(15)^2}{500} = 0.45W = P_{500}$$

$$P_{2000} = \frac{V^2}{R} = \frac{(75-15)^2}{2000} = 1.80W = P_{2000}$$

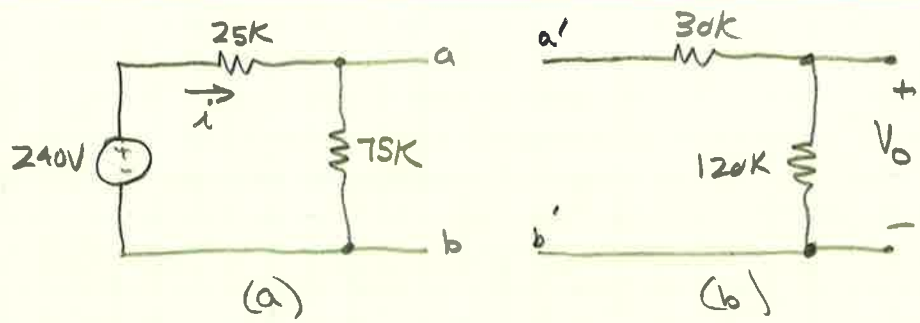
c) For $V_o = 15V$ and 1W maximum Resistor, find the smallest $R_1 + R_2$ can be

The ratio of $R_1 : R_2$ has to remain the same

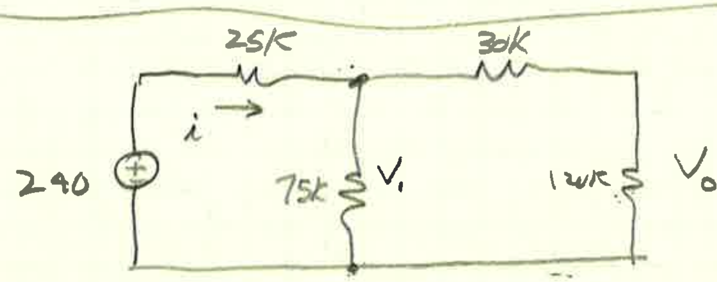
$$P_{R_1} = \frac{V^2}{R_1} \text{ or } \frac{(60)^2}{R_1} \leq 1W$$

$$\boxed{R_1 \geq 3600\,\Omega}$$

For $R_1 = 3600$, $R_2 = \frac{3600}{4} = \boxed{900\,\Omega = R_2}$



The voltage divider in (a) is loaded with (b).
Find V_0.

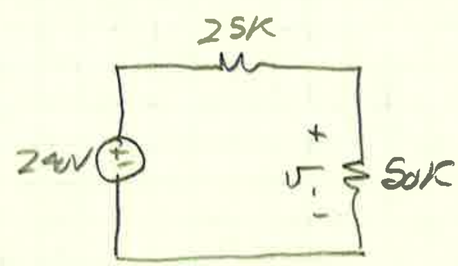


First find V_1 then use a voltage divider to find V_0.

$30K + 120K = 150K$

$75K \,//\, 150K = \frac{(75)(150)}{75+150} = 50K$

The circuit now becomes:

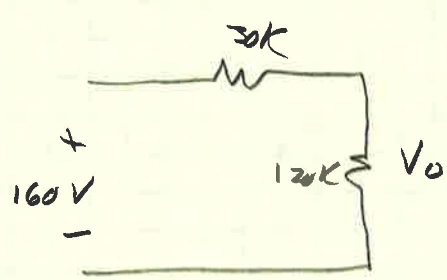


using a voltage divider,

$V_1 = \frac{240(50K)}{25K + 50K}$

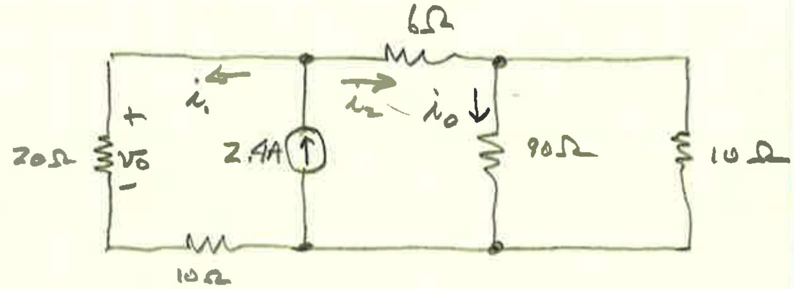
$= 160V$

now calculate V_0:



$V_0 = \frac{160\,(120K)}{30K + 120K}$

$\boxed{V_0 = 128V}$



a) find v_0 + i_0

the 90Ω + 10Ω in parallel = $\frac{10(90)}{10+90} = 9\Omega$

using a current divider,

$$i_2 = \frac{2.4(20+10)}{(20+10)+(6+9)} = 1.6A$$

again using a current divider,

$$i_1 = \frac{2.4(6+9)}{(6+9)+(20+10)} = 0.8A$$

Find i_0 using a current divider from i_2:

$$i_0 = \frac{1.6(10)}{10+90} = \frac{16}{100} = \boxed{0.16A = i_0}$$

$$V_0 = i_1(20) = \boxed{16V = V_0}$$

b) Find power dissipated in the 6Ω Resister

$$P_{6\Omega} = i_2^2 R = (1.6)^2 6 = \boxed{15.36W}$$

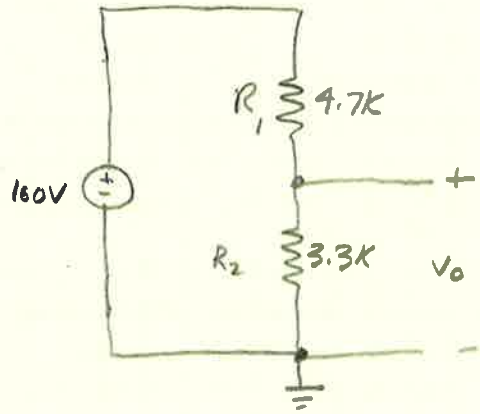
c) Find the power developed by the source

$$V_{source} = i_1(20+10) = (.8)(30) = 24V$$

$$P_{source} = 24(2.4) = \boxed{57.6W \text{ generated}}$$

a) FIND V_o

- assume reference at Bottom of circuit



using Voltage divider,

$$V_o = \frac{160v(R_2)}{R_1+R_2}$$

$$\boxed{V_o = 66\,V}$$

b) $P_{R_1} = \frac{V^2}{R} = \frac{(160-66)^2}{4.7K} = \boxed{1.88\,W}$

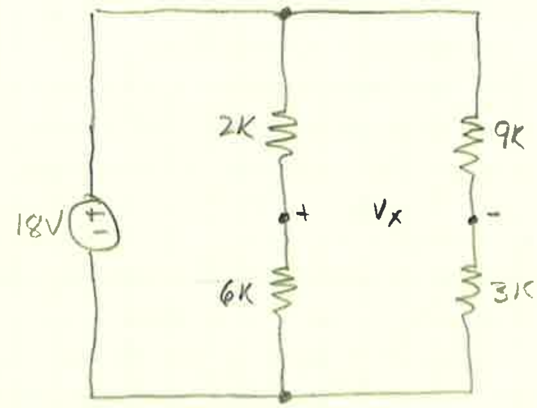
$P_{R_2} = \frac{(66)^2}{3.3K} = \boxed{1.32W}$

c) assume only .5W resistors available + V_o is the same as part a. Find the smallest value of R_1 + R_2

For R_2, $P_{R_2} = \frac{V^2}{R_2} \Rightarrow 0.5 = \frac{(66)^2}{R_2} \Rightarrow \boxed{R_2 = 8.71k\Omega}$

For R_1, $P_{r_1} = \frac{(160-66)^2}{R_1} \Rightarrow 0.5 = \frac{(94)^2}{R_1} \Rightarrow \boxed{R_1 = 17.67K\Omega}$

a) find v_x



For left branch:

$$V_{x+} = \frac{18(6K)}{6K+2K} = 13.5V$$

$$V_{x-} = \frac{18(3K)}{9K+3K} = 4.5V$$

$$V_x = V_{x+} - (V_{x-}) = \boxed{9.0V}$$

b) Replace the 18V source with a general source V_s. Find V_x in terms of V_s.

$$V_{x+} = \frac{V_s(6K)}{6K+2K} = \frac{3}{4}V_s$$

$$V_{x-} = \frac{V_s(3K)}{9K+3K} = \frac{1}{4}V_s$$

$$V_x = V_{x+} - V_{x-} = \boxed{\frac{1}{2}V_s}$$