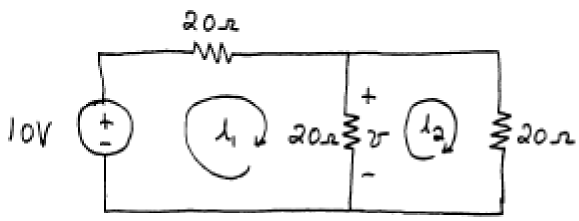
P2.69 Writing and simplifying the mesh equations, we obtain:

$$40i_1 - 20i_2 = 10 \qquad -20i_1 + 40i_2 = 0$$



Solving, we find $i_1 = 0.3333$ and $i_2 = 0.1667$.
Thus, $v = 20(i_1 - i_2) = 3.333\,\text{V}$.

P2.72 Writing and simplifying the mesh equations yields:

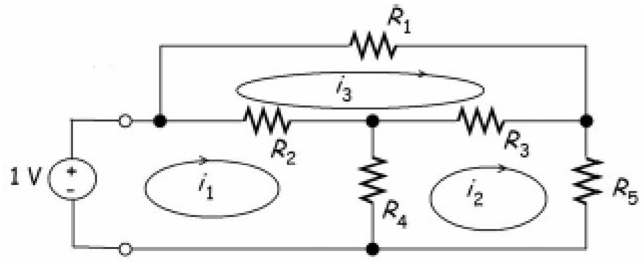
$14i_1 - 8i_2 = 10$

$-8i_1 + 16i_2 = 0$

Solving, we find $i_1 = 1.000$ and $i_2 = 0.500$.

Finally, the power delivered by the source is $P = 10i_1 = 10$ W.

P2.77



$$(R_2 + R_4)i_1 - R_4 i_2 - R_2 i_3 = 1$$

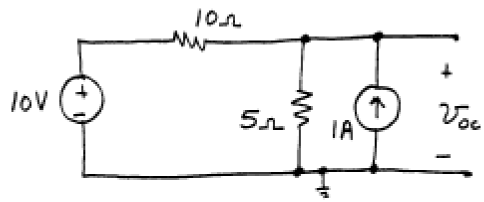
$$-R_4 i_1 + (R_3 + R_4 + R_5)i_2 - R_3 i_3 = 0$$

$$-R_2 i_1 - R_3 i_2 + (R_1 + R_2 + R_3)i_3 = 0$$

Now using MATLAB:

```
R1 = 6; R2 = 5; R3 = 4; R4 = 8; R5 = 2;
R = [(R2+R4) -R4 -R2; -R4 (R3+R4+R5) -R3; -R2 -R3 (R1+R2+R3)];
V = [1; 0; 0];
I =  R\V;
Req = 1/I(1) % Gives answer in ohms.
Req =
   4.5979
```

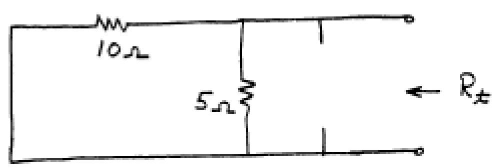
P2.80* First, we write a node voltage equation to solve for the open-circuit voltage:



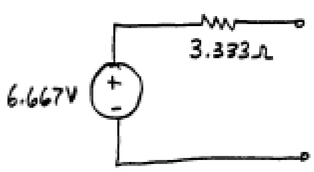
$$\frac{v_{oc}-10}{10}+\frac{v_{oc}}{5}=1$$

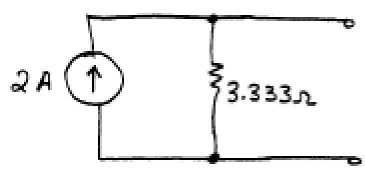
Solving, we find $v_{oc} = 6.667\text{ V}$.

Then zeroing the sources, we have this circuit:

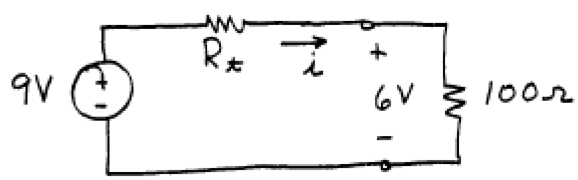


Thus, $R_t = \dfrac{1}{1/10+1/5} = 3.333\,\Omega$. The Thévenin and Norton equivalents are:





P2.81* The equivalent circuit of the battery with the resistance connected is



$i = 6/100 = 0.06\text{ A}$ $\qquad$ $R_t = \dfrac{9-6}{0.06} = 50\,\Omega$

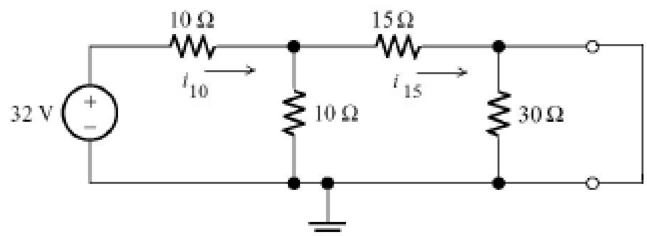
P2.83 First, we solve the network with a short circuit:

$$R_{eq} = 10 + \frac{1}{1/10 + 1/15} = 16\,\Omega$$

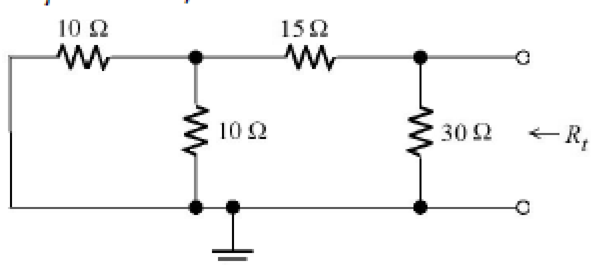
$$i_{10} = 32/R_{eq} = 2\text{ A}$$

$$i_{15} = i_{10}\frac{10}{10+15} = 0.8\text{ A}$$

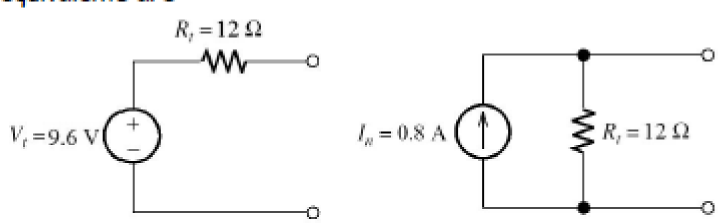
$$i_{sc} = i_{15} = 0.8\text{ A}$$



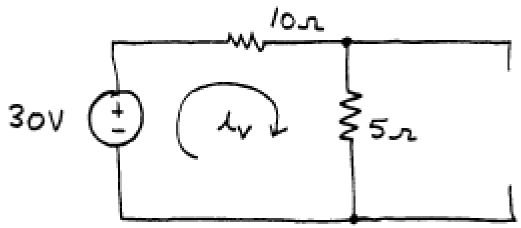
Zeroing the source, we have:



Combining resistances in series and parallel we find $R_t = 12\,\Omega$.
Then the Thévenin voltage is $v_t = i_{sc}R_t = 9.6\text{ V}$. The Thévenin and Norton equivalents are:

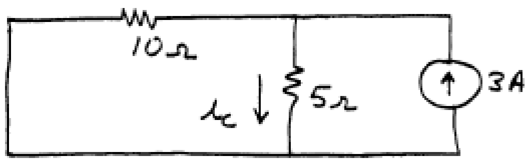


P2.94* First, we zero the current source and find the current due to the voltage source.



$i_v = 30/15 = 2\ A$

Then, we zero the voltage source and use the current-division principle to find the current due to the current source.

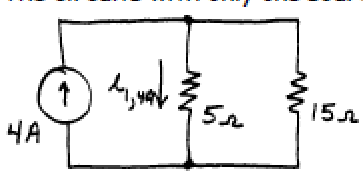


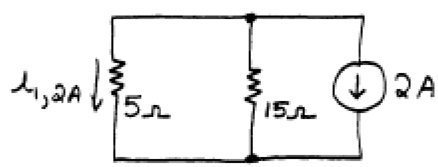
$$i_c = 3\frac{10}{5+10} = 2\ A$$

Finally, the total current is the sum of the contributions from each source.

$i = i_v + i_c = 4\ A$

P2.97 The circuits with only one source active at a time are:





$$i_{1,4A} = 4 \times \frac{15}{15+5} = 3\ A$$

$$i_{1,2A} = -2 \times \frac{15}{15+5} = -1.5$$

Finally, we add the components to find the current with both sources active.

$$i_1 = i_{1,4A} + i_{1,2A} = 1.5\ A$$