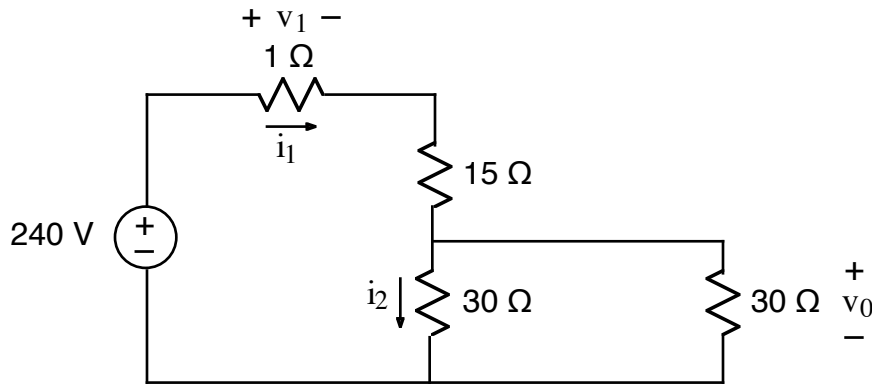
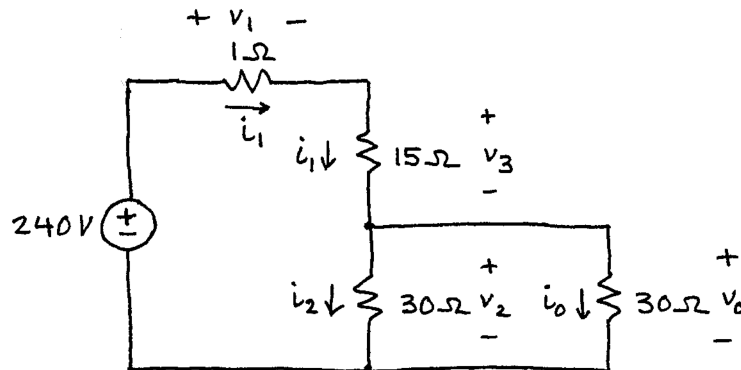


Ex:



Calculate  $i_1$ ,  $i_2$ , and  $v_0$ .

sol'n: First, we label R's.



Second, we write v-loop eq's. We write eq's for both inner loops.

$$+240V - v_1 - v_3 - v_2 = 0V$$

$$+v_2 - v_0 = 0V$$

Third, we write current-sum eq's for all but one node. For the node between R's on the right side we have

$$-i_1 + i_2 + i_0 = 0A$$

Fourth, we equate currents for components in series. We have already done this, however, by using  $i_1$  for both the  $1\Omega$  and  $15\Omega$  R's.

Fifth, we write Ohm's law eq'ns for every R:

$$v_1 = i_1 \cdot 1\Omega$$

$$v_3 = i_1 \cdot 15\Omega$$

$$v_2 = i_2 \cdot 30\Omega$$

$$v_0 = i_0 \cdot 30\Omega$$

Now we use the Ohm's law eq'ns to substitute for v's:

$$+240V - i_1 \cdot 1\Omega - i_1 \cdot 15\Omega - i_2 \cdot 30\Omega = 0V$$

$$+ i_2 \cdot 30\Omega - i_0 \cdot 30\Omega = 0V$$

Our current sum eq'n is unchanged:

$$-i_1 + i_2 + i_0 = 0A$$

From the 2nd of the above 3 eq'ns we have

$$i_0 = i_2$$

Using this in the 3rd eq'n gives

$$i_1 = 2i_2$$

Using this in the 1<sup>st</sup> eq'n gives

$$+240V - 2i_2(1\Omega + 15\Omega) - i_2 \cdot 30\Omega = 0V$$

$$\text{or } i_2(2 \cdot 16\Omega + 30\Omega) = 240V$$

$$\text{or } i_2 = \frac{240V}{62\Omega} = \frac{120}{31} A \approx 3.87A$$

$$i_1 = 2i_2 = \frac{240}{31} A \approx 7.74A$$

$$v_o = i_o \cdot 30\Omega = i_2 \cdot 30\Omega = \frac{120(30)}{31} V$$

$$\text{or } v_o = \frac{3600}{31} V \approx 116V$$