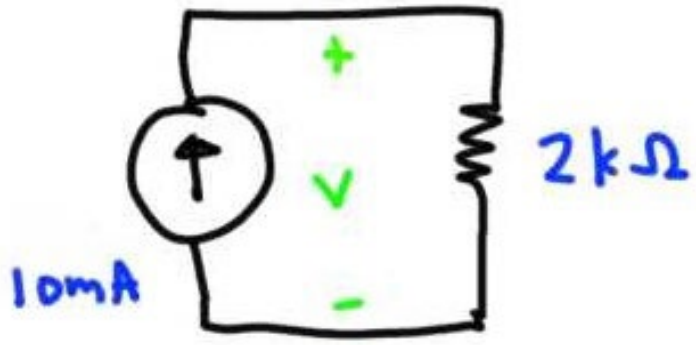
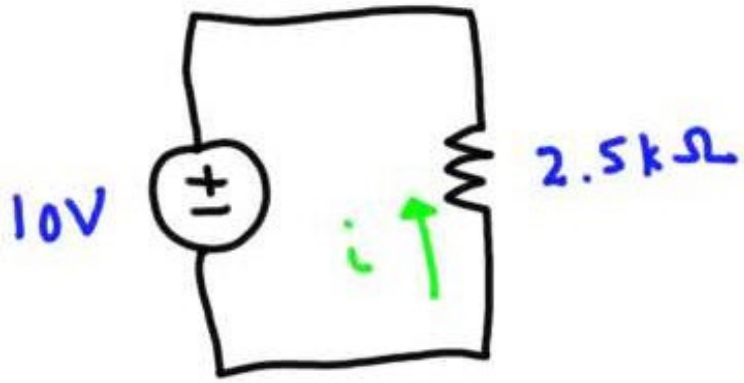
Circuit Basics: It is fair to say that one of the most challenging issues regarding circuit analysis is keeping track of signs. Variables of electrical interest, like voltage, current, and power all have signs associated with them. Unfortunately, one mistaken sign leads to solutions to systems of equations that make no sense, or worse, make sense but are incorrect. Consider the following simple examples and work how the signs would change on some of the variable of interest.

1) For the circuit shown below, find the following:



a) Find the voltage, v.
b) Find the power absorbed by the resistor.
c) Reverse the direction of the current source and repeat parts (a) and (b).

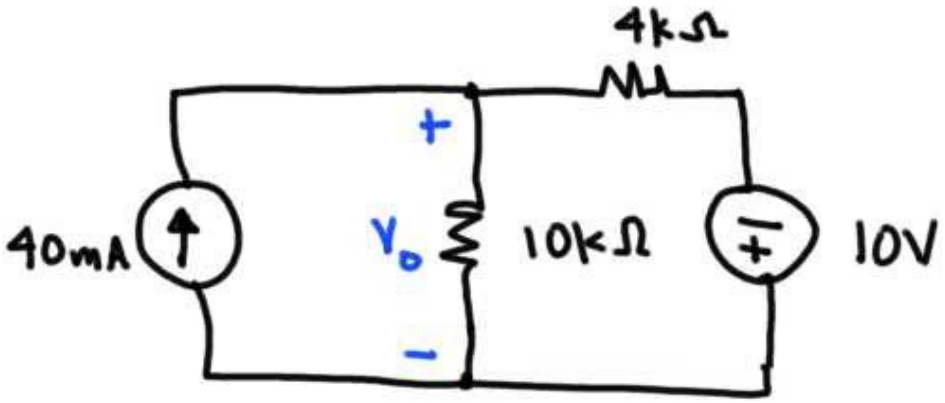
2) For the circuit shown below, find the following:



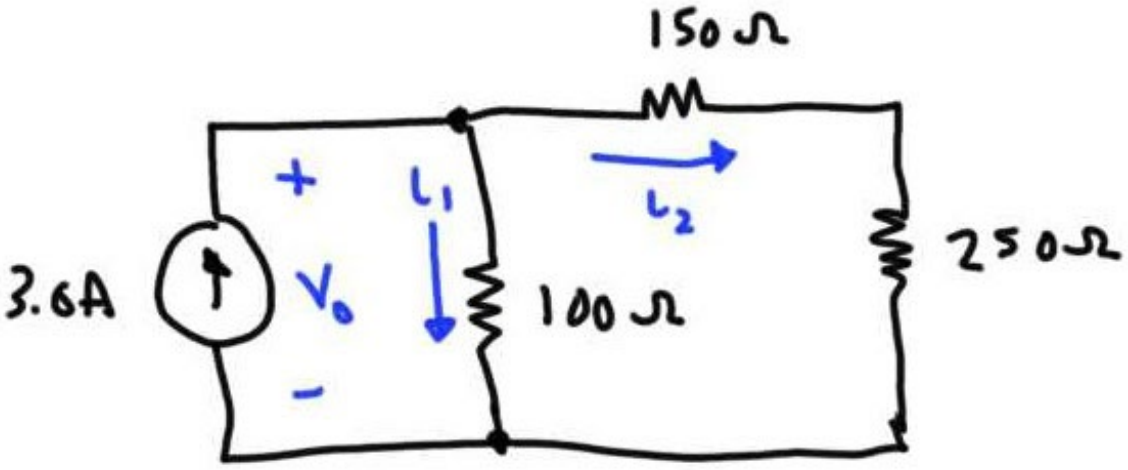
d) Find the current, i.
e) Find the power supplied by the voltage source.
f) Reverse the polarity of the voltage source and repeat parts (a) and (b).

Applications of KCL, KVL, and Ohm's Law: Given judicious applications of Kirchhoff's two laws and Ohm's law, solve the following circuits.

1) Consider the circuit shown below
   a) Find the voltage v_0
   b) Verify that the total power supplied equals the total power consumed.

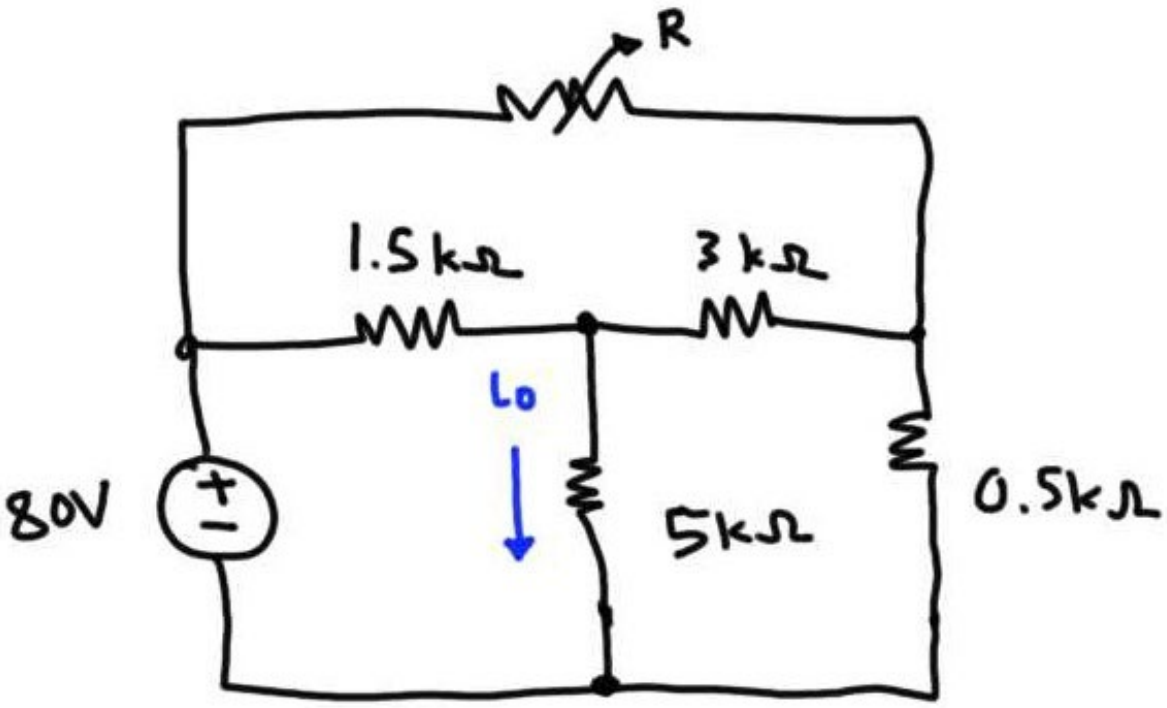


2) Consider the circuit below
   a) Find the currents i_1 and i_2 in the circuit
   b) Find the voltage, v_0
   c) Verify that the total power dissipated is equal to the total power generated.



Kirchhoff's Laws and Beyond: Sometimes, as an engineer, you may be asked to solve problems that require a little more thinking. Consider the circuit problems below.

1) The variable resistor R is adjusted until i_0 equals 10 mA. Find the value of R.



2) Find v_1 and v_g in the circuit when v_0 equals 5V. (*Hint*: Begin at the right end of the circuit and work toward v_g.)