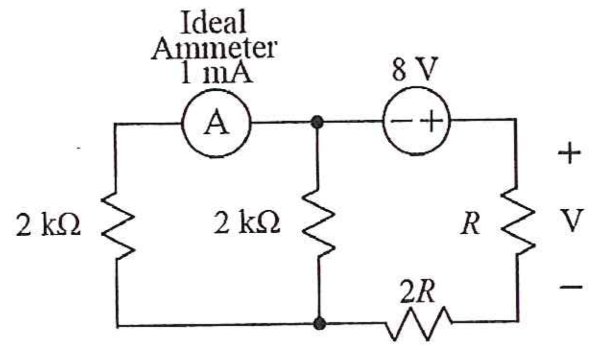
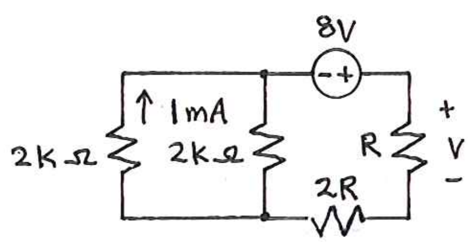
1. (20 points)



a) Find V.

b) Find *R*.

sol'n: a) The ideal ammeter has no V-drop, so we may redraw the circuit as follows:



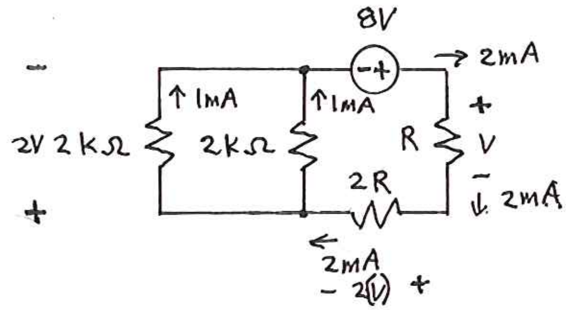
The current in the 2kΩ must be flowing up since the 8V source will push current out the + side.

The two 2kΩ resistors in parallel will have the same V-drop, so 1mA flows up thru the 2kΩ resistor in the middle, too. (Same R's, same V-drops, so same current.)

The voltage drop across each 2kΩ resistor will be $V = IR = 1mA \cdot 2k\Omega = 2V$.

At the bottom node, the current flowing into the node from the right must be 2mA because 1mA + 1mA flows out of the node thru the 2kΩ R's.

Our new picture:



We must have $2 \cdot (V)$ across 2R since we have V acros R, and the same current flows in R and 2R.

From a V-loop around the outside we have

$$-2V + 8V - V - 2(V) = 0V$$

or

$$6V - 3(V) = 0V$$

or

$$V = 2V$$

b) From the above calculation, we have 6V across $2R + R = 3R$. Using the V-divider formula, we have 2V across R as the answer for part (a). We also have 2mA thru R so we can use Ohm's law to find R.

$$R = \frac{2V}{2mA} = 1k\Omega$$