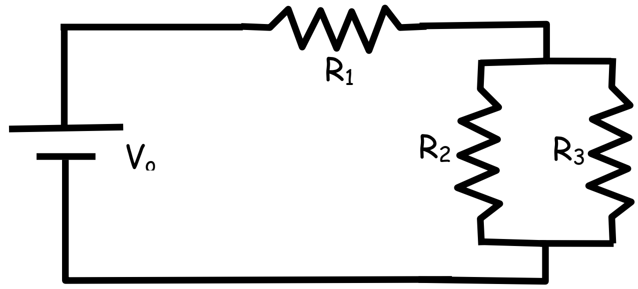
Circuit Worksheet Physics 104 Spring 2010

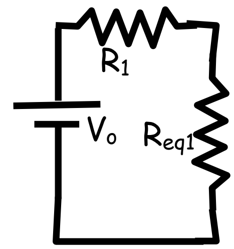
Our goal is to determine the current through and voltage across each of the resistors in the circuit below. In this circuit, V_0 = 10V,
R_1 =30 Ω, R_3 = 40 Ω and R_4 = 60Ω



Let's begin by reducing our circuit to one resistor.

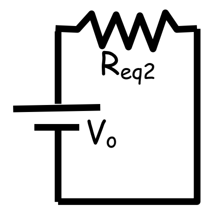
1. Look at the circuit and determine whether there are any resistors in parallel. If there are, reduce them to one resistor called R_{eq1}, and sketch the new circuit on the right.

$$\frac{1}{R_{eqparallel}} = \frac{1}{R_a} + \frac{1}{R_b} + \frac{1}{R_c}$$



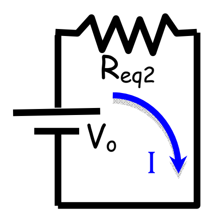
2. Look at the circuit and determine whether there are any resistors in series. If there are, reduce them to one resistor called R_{eq2}, and sketch the new circuit on the right.

$$R_{eqseries} = R_a + R_b + R_c$$

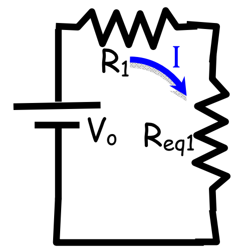


At this point we have one resistor, but you could continue this process if there were more ways to reduce the circuit.

3. Eventually we have worked our way down to one resistor (not all circuits can be reduced to a single element). Find the current through this resistor. $V = IR$



4. Now we can work our way backwards. We know the voltage across and the current through R_{eq2}. R_{eq2} was formed from the series combination of R_1 and R_{eq1}. Since elements in series have the same current, we know the current through R_1 and R_{eq1}. Since we know the current and the resistance, we can find the voltages V_1 and V_{1eq}.



5. Since R_{eq1} was formed from the parallel combination of two resistors, and since we know that resistors in parallel have the same voltage, we now know the voltage across these two resistors. AND since we know their resistance, we can find the current through them.