Honors Physics: Circuits
Class Examples

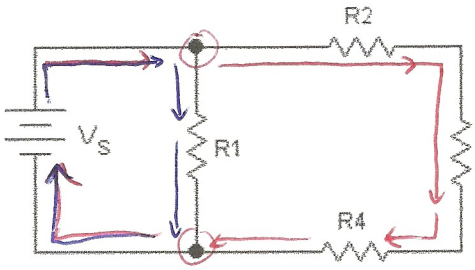
Combination Circuits

Example 12

A series and parallel circuit combination has a voltage of 18.0 v at the source. The values of the resistors are as follows:

$R_1 = 53.00\ \Omega$ $R_3 = 95.00\ \Omega$
$R_2 = 65.00\ \Omega$ $R_4 = 75.00\ \Omega$

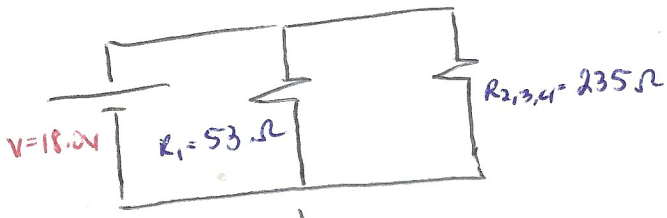
A. Find the equivalent resistance (R_{eq})
B. Find the total current at the battery.
C. Find the current and voltage drop across each resistor.



$R_{2,3,4} = R_2 + R_3 + R_4$

$R_{2,3,4} = 65 + 95 + 75$

$R_{2,3,4} = 235\ \Omega$

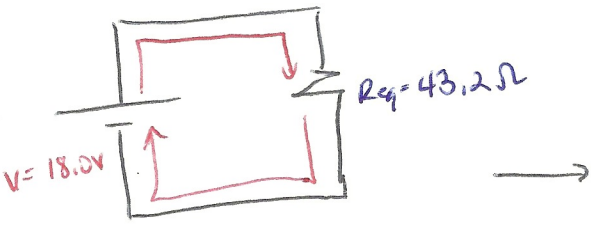


$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_{2,3,4}}$

$\frac{1}{R_{eq}} = \frac{1}{53} + \frac{1}{235}$

$\frac{1}{R_{eq}} = 0.0231$

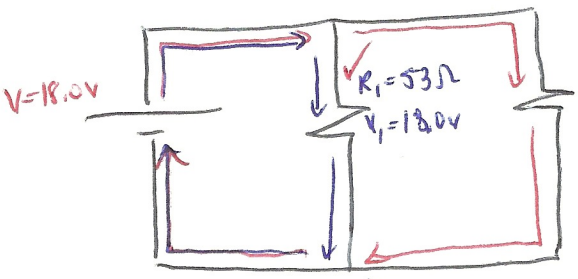
$R_{eq} = 43.2\ \Omega$



$V = I \cdot R$

$I = \frac{V}{R} = \frac{18}{43.2}$

$I = 0.417\ A$



$I_1 = \frac{V}{R}$

$I_1 = \frac{18}{53}$

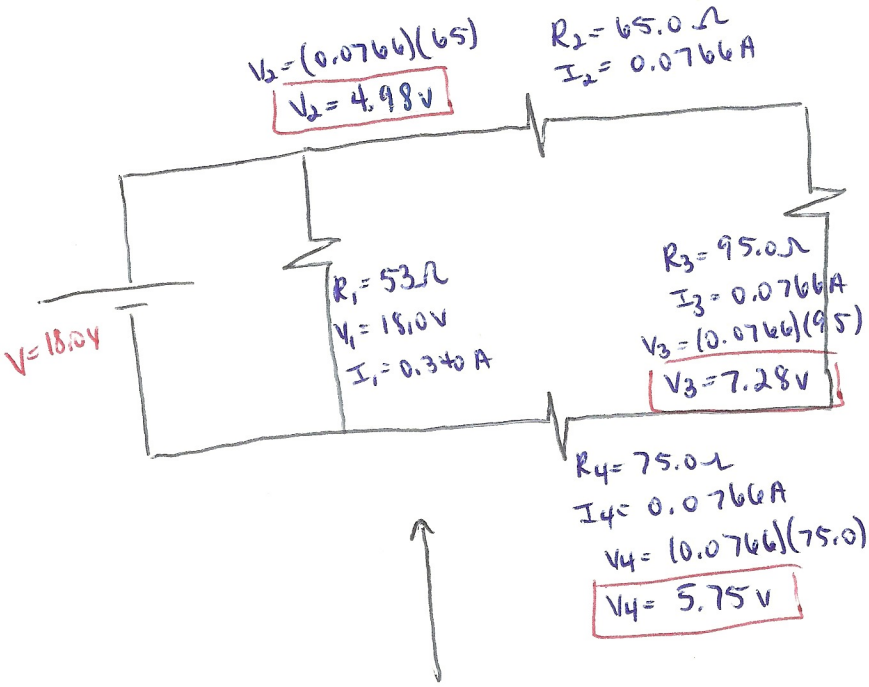
$I_1 = 0.340\ A$

$R_{2,3,4} = 235\ \Omega$

$V_{2,3,4} = 18.0\ V$

$I_{2,3,4} = \frac{V}{R} = \frac{18}{235}$

$I_{2,3,4} = 0.0766\ A$



$V_2 = (0.0766)(65)$

$V_2 = 4.98\ V$

$V_3 = (0.0766)(95)$

$V_3 = 7.28\ V$

$V_4 = (0.0766)(75.0)$

$V_4 = 5.75\ V$