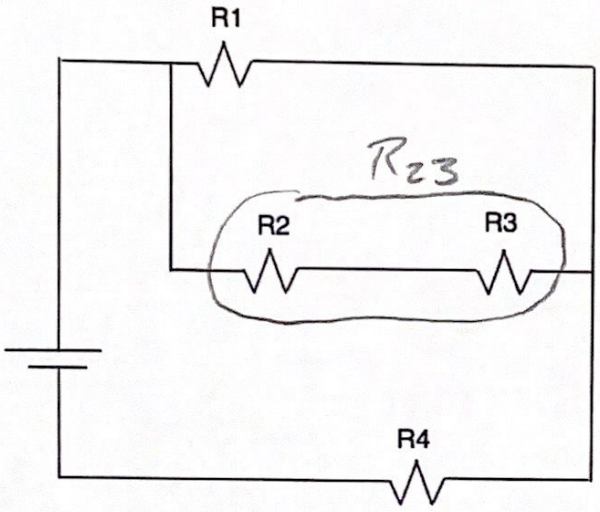
Quiz 20.1B

A 12.0-Volt battery is connected to a circuit as shown below. R1 = 1.52 Ohms, R2 = 2.35 Ohms, R3 = 3.41 Ohms, R4 = 4.45 Ohms.

a) What is the equivalent resistance of the circuit?
b) What is the current passing through resistor R1?
c) If R4 is removed from the circuit, does your answer to (b) increase, decrease or remain the same? Justify your answer.



Series

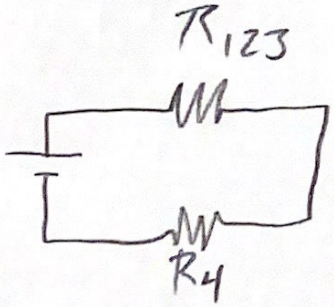
$R_{23} = R_2 + R_3$

$= 5.76\ \Omega$

Parallel:

$\frac{1}{R_1} + \frac{1}{R_{23}} = \frac{1}{R_{123}}$

$\Rightarrow R_{123} = 1.20\ \Omega$



Series

$R_{TOT} = R_{123} + R_4$

$= 5.65\ \Omega$

b) $I_{TOT} = \frac{12}{R_{TOT}} = 2.12\ A$

$\Rightarrow I_{123} = 2.12\ A$

$\Rightarrow \Delta V_{123} = I_{123} R_{123} = 2.55\ V$

$\Rightarrow \Delta V_1 = 2.55\ V$

$I_1 = \frac{\Delta V_1}{R_1} = \boxed{1.68\ A}$

c) R_{TOT} now $1.20\ \Omega$

so I_{TOT} = larger

still split same way,

so $\boxed{I_1 \text{ also larger}}$