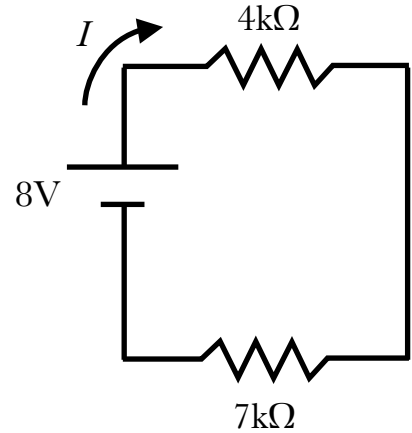# Physics 102 Homework #9
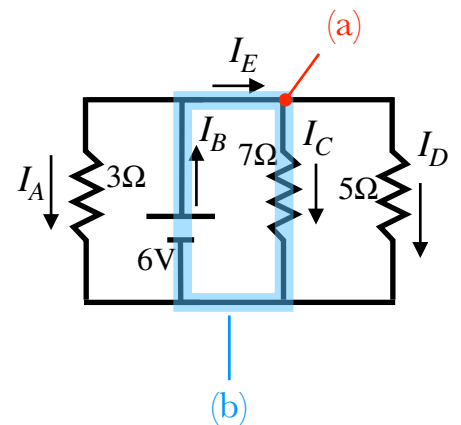
first draft due Wednesday, April 12th
final draft due Sunday, April 16th

1. Find the current in this circuit.

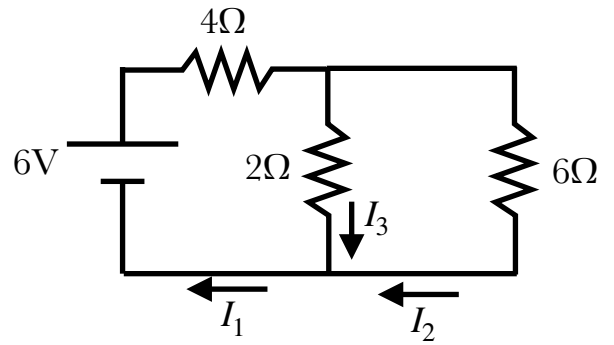**2.** Consider this circuit.

a) Write a junction rule equation for the junction marked (a).

b) Write a loop rule equation for the loop marked (b).

c) Find the current I_A.

**3a.** Write a junction rule equation for this circuit.

3b. Write two loop rule equations for this circuit.

3c. Use your equations to solve for I_1, I_2, and I_3 in this circuit, and fill in the table.

I_1	
I_2	
I_3	

4. Real batteries have an internal resistance r in addition to its emf $\mathcal{E}$. Suppose we have a real battery with $\mathcal{E} = 9V$ and an internal resistance $r = 5\Omega$.

a. What is the potential difference ΔV across the ends of this battery, as a function of the current I through it?
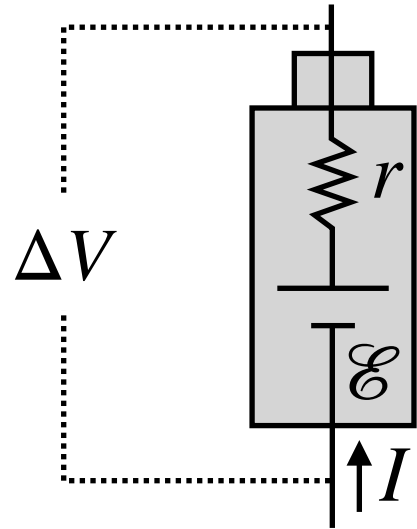
b. What is the maximum amount of current I_{max} that can be produced by this battery?

c. The power output of the battery is $P = I\Delta V$. The maximum power output by the battery when $I = \dfrac{1}{2}I_{max}$. Find the maximum power output of the battery.

5a. What is the equivalent resistance of these two resistors?

2Ω

8Ω

$6V$
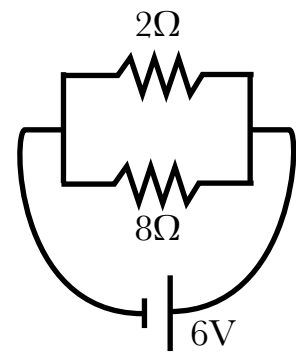
5b. Use the equivalent resistance to find the current through the 6V battery.

6. What is the equivalent resistance of this set of resistors? Use resistance reduction.

2Ω

4Ω

6Ω