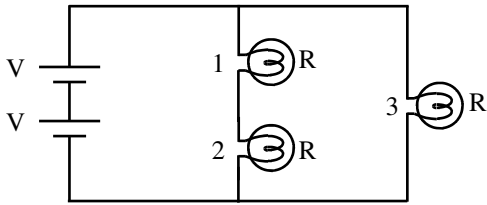# 2013 PreAP Circuits 8

1. Three light bulbs of equal resistance and two batteries of equal voltage are configured in a circuit as shown.

   A. What is the total voltage of the circuit?

   B. If resistor 1 is unscrewed describe what happens to the other bulbs?

   C. If resistor 3 is unscrewed describe what happens to the other bulbs?

   D. * How much current flows thru R_1?
      (*Yes, you are working in variables*.)

   E. How much current flows thru R_3?

   F. * What is the total current flowing thru the batteries?

   G. Using V = IR for the totals, calculate the total resistance of the circuit.
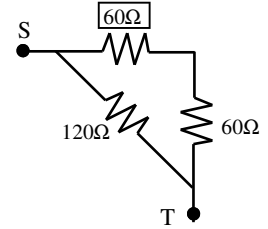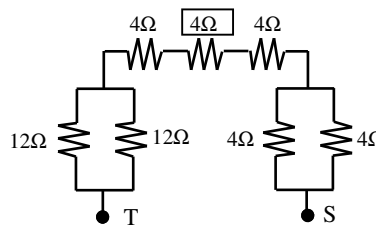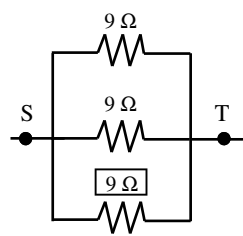
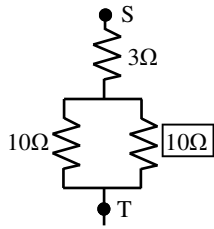2. Use the four diagrams below to answer the following.

   A. Find the equivalent resistance for each of the following. Note: Each of them can be done easily without a calculator.

   A_I. * Rt = _____ A_{II}. Rt = _____ A_{III}. * Rt = _____ A_{IV}. Rt = _____

   B_I. * It = _____ B_{II}. It = _____ B_{III}. * It = _____ B_{IV}. It = _____

   B. If a 9V power supply is placed from points S to T in each example. Calculate total current for each resistors combo.

   C. * Determine the current flowing thru the selected resistors (the ones with the boxes around them). Again, this is very easy. Write the current under or next to the selected resistor.

3. Use the circuit at the right to answer the following. Remember: included units on all numbers and work the circuit first.

   A. * Calculate the currents throughout the circuit.
   B. How much current flows thru the 9Ω?
   C. Calculate I_{total}.

   D. How does $I_{D \text{ to } J}$ compare to $I_{E \text{ to } I}$?
   E. How does $R_{D \text{ to } J}$ compare to $R_{E \text{ to } I}$?

   F. How does $I_{D \text{ to } J}$ compare to $I_{F \text{ to } H}$?
   G. How does $R_{D \text{ to } J}$ compare to $R_{F \text{ to } HI}$?

   H. What is R_{total}?

   I. * Calculate the voltage used by the 9Ω resistor.

   J. Calculate P used by the 9Ω resistor.

   K. * What is the voltage at point K?

4.   * Once again, take V = IR and put it into P = VI and get a power equation with only I and R in it.

5.   * Solve for I in the V = IR equation and substitute it into P = VI and get a power equation with only I and R in it.

6.   A 9V battery is placed across a 180Ω resistor.
    A. How much current flows thru the resistor?
    B.   * Remembering that I = Q/t, where Q is charge in coulombs,
        how much charge flows thru the resistor in 10 seconds?

    *Volts break down into Joules/Coulomb, or the amount of works done or energy given by a voltage source
    (like a battery [known as a source of emf {electromotive force}]).   (Enough parenthesis for you?)*

7.   * How much work does a 9V battery do on 3 C of charge?

8.   A source of emf does 36 J of work to move 4 C thru a circuit. How much voltage is the battery providing?

9.   A 12Ω resistor has 3A flowing thru it.
    A.   * How much charge flows in 2 seconds?

    B. How much voltage does the resistor use?

    C.   * How much energy does the resistor use in 2 seconds?

    D. (*Or, going another way…*) How much power does the resistor dissipate? (Use the equation from Q4 or 5.)

    E. Since P = [J/s], calculate the energy used by the resistor in 2 seconds?.

1D: 2V/2R = V/R
1F: 3V/R
2A$_I$: Rt = 3+5 = 8Ω
2A$_{III}$: 20 Ω
2B$_I$: 9/8 = 1.125 A
2B$_{III}$: 9/20 = 0.45A
2CI: The right 10Ω resistor is equal to the other, so the each have half the current = 0.45/2 = .563 A
3A: 2rd branch's current (E to I) = 24V/6Ω = 4A.
3K: 24V—18V = 6V left at K.
4: P = I^{2}R
5: P = V^2/R
6B: 0.05 A = 0.05C/sec   times 10 sec = 0.5 C
7: 9V = 9 J/C   So (9J/C)(3C) = 27J
9A: 6C (from 3A = 3C/s times 2 sec)
9C: [J] comes from [J/C] which comes from Volts, so 216 J