# PreAP Circuits 7

*A little more about units: You know that m/s means meters every second. It also means meters divided by seconds. The units tell you the formula. Likewise, momentum is kgm/s, meaning multiple kg times meters and divide by seconds OR m(d)/t = mv = p. Also, 6 m/s can also be written as 1sec/6m, if you need seconds on the top. The units will guide you… always.*

1. * Convert 560W to kW.
2. A. * A resistor hooked up to 120V has 16A flowing thru it. How many kW does it use?

   B. If the resistor is on for 30 minutes, how many hours is it on for?

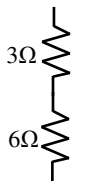
   C. * How many kWhr does it use?

3. * An electric company sells electricity for 12 cents per kWhr, how much does it cost for 118kWhr?

4. * A 800W oven cooks a turkey in 4.5 hours. If the electric company charges 13 cents per kWhr, how much does it cost for a 800W oven to roast a turkey for 4.5 hours?

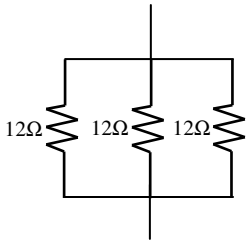
5. Using your "Total Resistance" notes, decide if the following are in parallel or series and calculate the equivalent resistance.

A. Parallel or series?



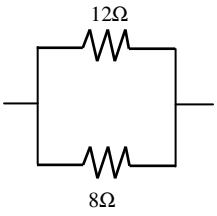

Rt = _____

B. Parallel or series?



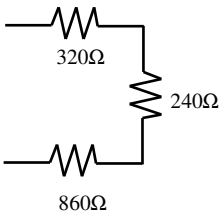

* Rt = _____

C. Parallel or series?




* Rt = _____

D. Parallel or series?




Rt = _____

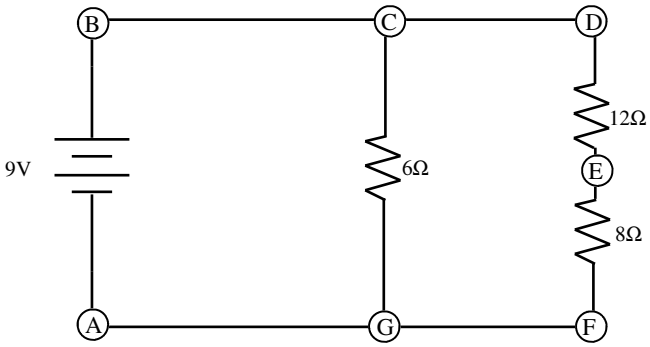
6. Work the following circuit and answer the questions. (*Follow the same procedure as the circuit on the last homework. As a result I am not going to give help with this circuit.)*

   A. What is the total current of the circuit?

   B. What is the total resistance of the circuit?

   C. What is the total power given by the battery?

   D. What is the voltage at point E?



**Coulomb's Law**

Charge 1 (*in Coulombs*) and Charge 2 (*in C*)

Electric Force (*in N*) → $\overrightarrow{F_e} = k_c \frac{|q_1 q_2|}{r^2}$ ← Distance between the two charges (*in m*). **r is always positive**.

Coulomb's Constant = $9\times10^9\ \text{Nm}^2/\text{C}^2$

$$\overrightarrow{E} = k_c \frac{|q_1|}{r^2} \qquad V = k_c \frac{q_1}{r} \qquad PE = k_c \frac{q_1 q_2}{r}$$

*Electric Field (N/C)* *Voltage (V or J/C)* *Electric PE (J)*

*In the next chapter we will work with the above four equations. It will be useful for us to start learning how to calculate with them now, little by little. Notice that two of the equations are vectors (have arrows over them). These are based on Newtons, which you already know to be vectors. The other two are scalars, based on energy.*

7. A 6 C charge and a −2 C charge are 4,000 m apart.
   A. * What is the magnitude of the electric force between them?

   B. What is the electrical potential energy between them? (*If you study the equations you will see a short cut.)*

   *In actuality, a 1 C charge is huge. Instead, we usually talk about microcoulombs (μC). $1\mu C = 1\times10^{-6}$ C. Remember to use the "EE" key for powers of 10. Example: $3\mu C = 1\times10^{-6}$ C and in the calculator looks like 3E−6. DO NOT use the ^ key.*

8. * Calculate the voltage −2 m (negative means "left") from a 7μC charge. (*Hint: double check what "r" stands for in the equation box for force [the underlined words*]).

Q1: 0.56 kW (remember that 1000 m = 1 km)
Q2A: P = VI, so P = 1.92 kW
Q2C: 0.96kW
Q3: 1416 cents = $14.16
Q4: convert 800W to 0.8kW first. Final answer = 47¢
Q5B: 4Ω (12/3. 3 = holes is 3 times the current = 1/3 the resistance)
Q5C: have to use 1/Rt = 1/R1 + 1/R2… Rt = 4.8Ω
Q7A: $-6.75\times10^3$ N
Q8: $3.15\times10^3$ V or J/C. Why +, because q is + and r is + (r is always +).