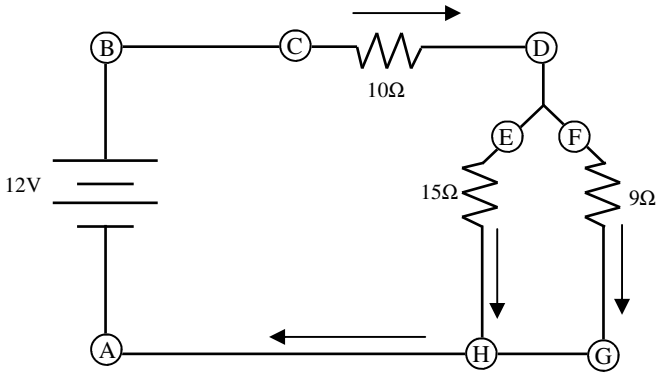
PreAP Circuits 10

1. You are given a bunch of 20Ω resistors. You can put them together in any combination of series and parallel.
   A. How could you make 100Ω?
   B. How could you make a 5Ω?
   C. How could you put them together to make 50Ω worth of resistance? (*Get creative.*)

From the "Electrical Power" notes:

2. A. Two light bulbs of different resistance are in series, which one is brighter?
   B. Why? (*Talk about current and voltage.)*
3. A. Two light bulbs of different resistance are in parallel, which one is brighter?
   B. Why?
4. * What do these units break down? V = Watt = Amp =
5. * Heat is also measure in joules. A 3kΩ resistor has 2.5A flowing thru it. How much heat is does it generate in 2 minutes?
6. * A 4.5kΩresistor is hooked up to a 120V circuit. How long is it on if 113 coulombs passes thru it?
7. Two 9-volt batteries are connected in series. If the batteries do 36 J of work, how much charge is moved thru the circuit?
8. * A 45 Ω and a 120 Ω resistor are in series in a circuit. The 120Ω resistor uses 160W. How much current flows thru the other resistor?
9. Let me talk you thru this circuit. It would be VERY helpful if you labeled the diagram as you answer the questions. I didn't take the time to work out even numbers.

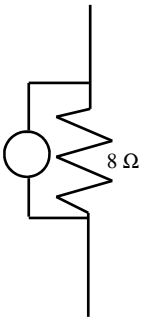


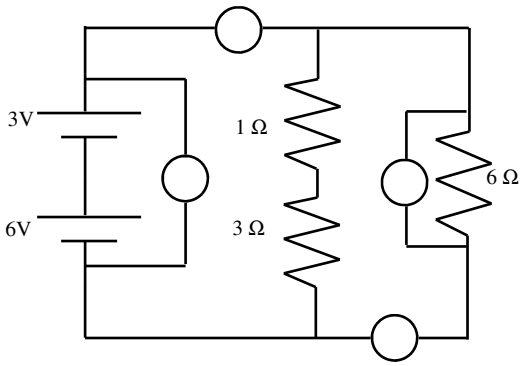
   A. What is the voltage at A?
   B. What is the voltage at C?
   C. * What is the equivalent resistance for the 15Ω and 9Ω resistors?
   D. Redraw the simplified circuit below the original.
   E. From your simplified circuit what is the total resistance of the circuit?
   F. * What is the total current?
   G. How much current is flowing thru the 10Ω resistor? (*Mark this on the original circuit.*)
   H. * How much voltage is used by the 10Ω resistor?
   I. * How much voltage is left at D?
   J. * How much voltage is at E and F?
   K. * How much current flows thru the 15Ω resistor?
   L. How much current flows thru the 9Ω resistor?
   M. If the 15Ω and 9Ω resistors were light bulbs, which one would be brighter?

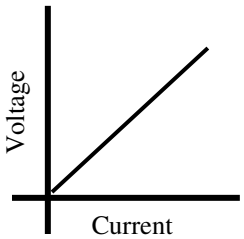
10. * Identify each of the meters at the right as an ammeter (A), ohmmeter (O), or voltmeter (V). (*Put the appropriate letter in the correct circle. Study help available.)*

11. Which kind of meter is in parallel with a device?

12. Which kind of meter is in series with a device?







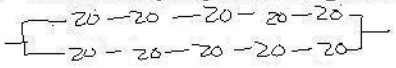
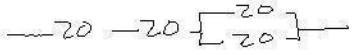
13. A. * The slope of the line on the graph gives what? (*See Circuits 3 for notes.*)

B. How would the line change in the following situations?
   i. * If the temperature of the conductor is lowered?
   ii. If wire is made longer?
   iii. If the wire is thicker?
   iv. If the wire is changed from silver to copper?

Q4A: V = J/C W = J/s A = C/s
Q5: 7500 W or J/s So, 9×10^5 J
Q6: 0.027 A or C/s So, 4185seconds
Q8: 1.15 A (in series, right? So same current)
Q9C: 5.625Ω
Q9F: 0.768A
Q9H: 7.68V
Q9I: 4.32V (or 12 – 4.32)
Q9J: 4.32 V (same wire)
Q9K: 0.288A (I = V/R)

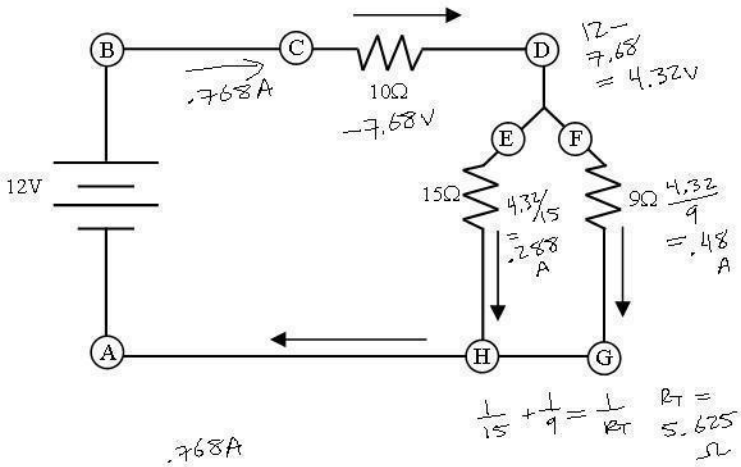
Due Fri., Jan 20

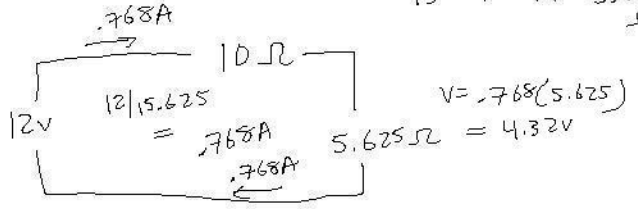
2011-12 PreAP Circuits 10

1. You are given a bunch of 20Ω resistors. You can put them together in any combination of series and parallel.
   A. How could you make 100Ω? 5 of them in series. (20+20+20+20+20)
   B. How could you make a 5Ω? $\frac{20}{4}$, so 4 of them in parallel
   C. How could you put them together to make 50Ω worth of resistance (*get creative*)?
   
   OR need 20+20+10, so
   

From the "Electrical Power" notes:

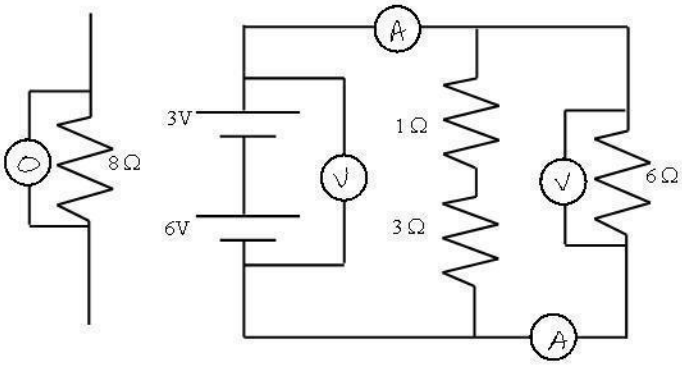
2. A. Two light bulbs of different resistance are in series, which one is brighter? Bigger R
   B. Why? (*Talk about current and voltage.*) *Same current. Bigger R = more voltage.*
3. A. Two light bulbs of different resistance are in parallel, which one is brighter? smaller R
   B. Why? *Same V. Smaller R = more current.*
4. * What do these units break down? V = J/C Watt = J/s Amp = C/sec
5. * Heat is also measure in joules. A 3kΩ resistor has 2.5A flowing thru it. How much heat is does it generate in 2 minutes?
   $P = I^2R = 2.5^2(3000) = 18{,}750\ \frac{J}{s}\ (120sec) = 2.25 \times 10^6\ J$
6. * A 4.5kΩresistor is hooked up to a 120V circuit. How long is it on if 113 coulombs passes thru it?
   $I = \frac{V}{R} = \frac{120}{4500} = .027\ A$ $.027\ \frac{C}{sec}$ $\frac{.027C}{1sec} = \frac{113C}{?sec}$ or $\frac{1sec}{.027C}(113C) = 4185sec$
7. Two 9-volt batteries are connected in series. If the batteries do 36 J of work, how much charge is moved thru the circuit?
   $18V = \frac{18J}{C}$ $\frac{1C}{18J}\ \frac{36J}{1} = 2$ coulombs
8. * A 45 Ω and a 120 Ω resistor are in series in a circuit. The 120Ω resistor uses 160W. How much current flows thru the other resistor?
   $P = I^2R$
   $160 = I^2(120)$ → so $I^2 = 1.33$
   $I = 1.15A$
   same current in both resistors, since they are in series.
9. Let me talk you thru this circuit. It would be VERY helpful if you labeled the diagram as you answer the questions. I didn't take the time to work out even numbers.





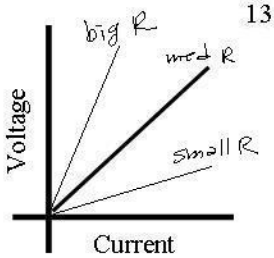
   A. What is the voltage at A? 0V
   B. What is the voltage at C? 12V
   C. * What is the equivalent resistance for the 15Ω and 9Ω resistors? 5.625 Ω
   D. Redraw the simplified circuit below the original.
   E. From your simplified circuit what is the total resistance of the circuit? 15.625Ω
   F. * What is the total current? 12/15.625 = .768A
   G. How much current is flowing thru the 10Ω resistor? .768A
   H. * How much voltage is used by the 10Ω resistor? 7.68V = 10(.768)
   I. * How much voltage is left at D? 4.32V
   J. * How much voltage is at E and F? 4.32V
   K. * How much current flows thru the 15Ω resistor? 4.32/15 = .288A
   L. How much current flows thru the 9Ω resistor? (the rest of it) .768 − .288 = .48A
   M. If the 15Ω and 9Ω resistors were light bulbs, which one would be brighter?
   9Ω – same V, less Ω, more I, more P

10. * Identify each of the meters at the right as an ammeter (A), ohmmeter (O), or voltmeter (V). (Put the appropriate letter in the correct circle.)



11. Which kind of meter is in parallel with a device?
Voltmeter

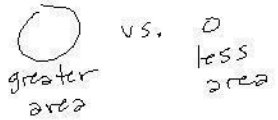
12. Which kind of meter is in series with a device?
ammeter

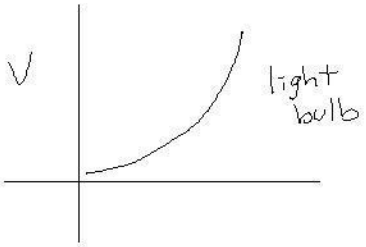


13. A. * The slope of the line on the graph gives what?
V/I = R

B. How would the line change in the following situations?
i. * If the temperature of the conductor is lowered? less slope
ii. If wire is made longer? more slope
iii. If the wire is thicker? less slope
iv. If the wire is changed from silver to copper? more slope

→ greater cross-sectional area





$V = IR$

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