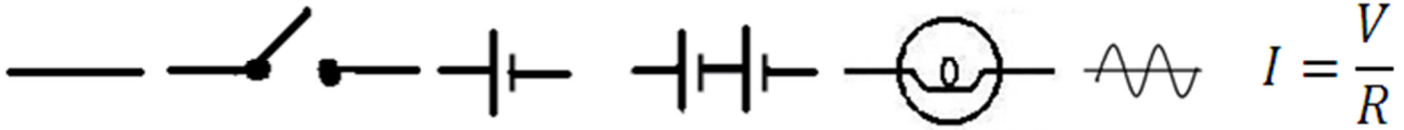


Answer all the following questions about series circuits. When you have to draw schematic diagrams, use the proper circuit symbols (below), and when you have to calculate, use Ohm's Law:

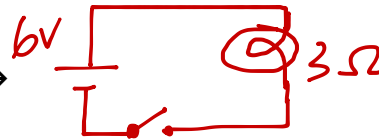


**Rules for series circuits:** 1) The voltage "drops" or is used up as it goes through each item that offers resistance, 2) The total resistance is the sum of all the individual resistors in the circuit, and they use voltage dependent upon how much resistance each resistor has. 3) Current can be determined by using Ohm's law and dividing the total voltage ( $V_T$ ) by total resistance ( $R_T$ ).

**Part 1:** Construct the following circuits out of the note cards parts. You have wire, light bulbs, switches, and dry cells (combine 2 or more to make a battery).

1. Create a circuit with one switch, one bulb and a single dry cell. I have to initial → Mr. S \_\_\_\_\_

2. Draw the schematic diagram of your circuit.  
Draw your diagram here using circuit symbols. →



3. Label the following values on your drawing: The battery is 6V and the light bulb provides 3Ω of resistance. What is the current in the circuit?

$$I = \frac{V}{R} = \frac{6V}{3\Omega} = 2A$$

2 A

4. Use the cards to create a circuit with two cells (a battery), three light bulbs, and a switch that controls all three bulbs. I have to initial → Mr. S \_\_\_\_\_

5. Draw the schematic diagram of the circuit using circuit symbols.



6. Label the following values: The cells are 6V each (a total of a 12V battery), and the light bulbs provide 4Ω of resistance each. What is the total resistance in this series circuit?  
(Hint: The total resistance in a series circuit is found by the formula below)

$$R_T = R_1 + R_2 + R_3 + \dots$$

$$R_T = 4\Omega + 4\Omega + 4\Omega = 12\Omega$$

12 Ω

7. What is the current throughout the circuit? (Hint: Use the  $R_T$  value from #6 for the  $R$  in Ohm's Law.)

$$I = \frac{V}{R} = \frac{12V}{12\Omega} = 1 \text{ Amp}$$

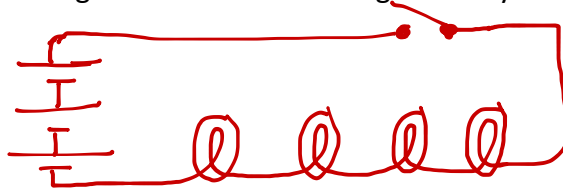
1 Amp

8. Given the current throughout the circuit (see answer # 7), what is the voltage drop used up at each light bulb? (Hint: the voltage is highest at the positive end of the battery, and is zero at the negative end of the battery.)

$$V = I \cdot R = 1A \times 4\Omega = 4V$$

9. Use the cards to create a circuit with three cells (a battery), four light bulbs, and a switch that controls all the bulbs. I have to initial → Mr. S\_\_\_\_\_

10. Draw the schematic diagram of the circuit using circuit symbols.



11. The  $R_T$  for the circuit (all 4 bulbs) is  $8\Omega$ . What is the resistance for each bulb if they are all equal?

$$8\Omega \div 4 \text{ bulbs} = 2\Omega \text{ each}$$

$2\Omega$

12. If the total resistance is  $8\Omega$ , and 12 Amps of current flow through the circuit, what is the total voltage in the circuit?

$$V = I \cdot R = 12 \text{ Amp} \times 8\Omega =$$

$96 \text{ Volts}$

**Part 2:** Use the following provided circuits to answer the questions.

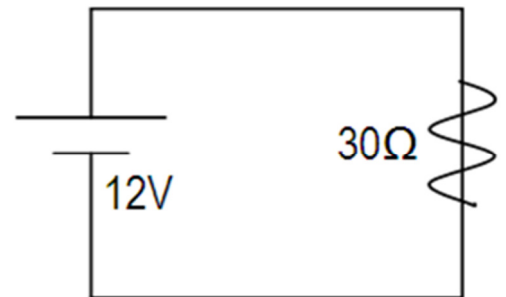
13. What does the following symbol represent?



*a resistor.*

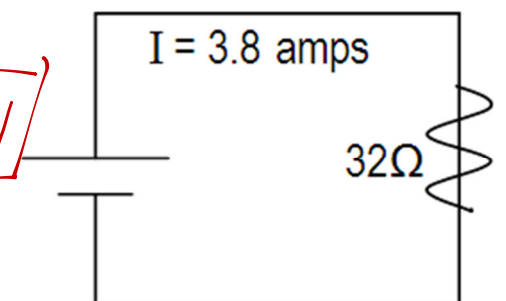
14. What is the current in the circuit to the right?

$$I = \frac{V}{R} = \frac{12V}{30\Omega} = \boxed{0.4A}$$



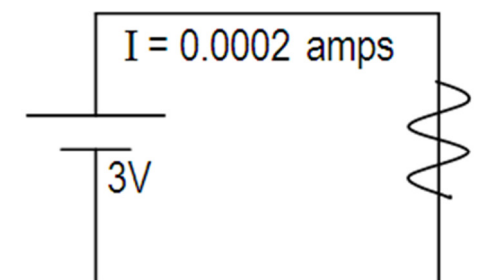
15. What is the voltage in the circuit to the right?

$$V = I \cdot R = 3.8 \text{ Amps} \times 32\Omega = \boxed{121.6V}$$



16. What is the resistance of the circuit to the right?

$$R = \frac{V}{I} = \frac{3V}{0.0002A} = 15,000\Omega$$



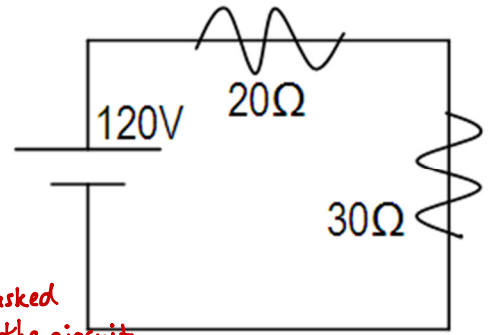
17. What is the total resistance of the circuit to the right?

$$R_T = 20\ \Omega + 30\ \Omega = 50\ \Omega$$

18. What is the current going through the circuit?

$$I = \frac{V}{R} = \frac{120V}{50\ \Omega} = 2.4\ \text{Amps}$$

Use the  $R_T$  because it asked for the current through the circuit.

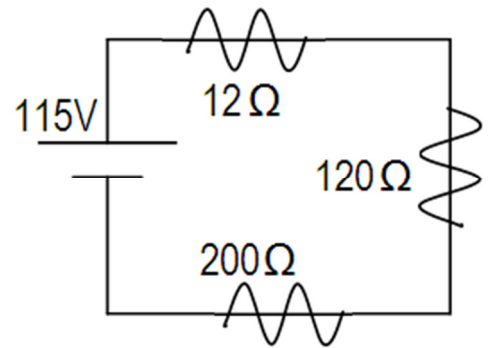


19. What is the total resistance of the circuit?

$$R_T = 12\ \Omega + 120\ \Omega + 200\ \Omega = 332\ \Omega$$

20. What current flows through the circuit?

$$I = \frac{V}{R} = \frac{115V}{332\ \Omega} = 0.35\ \text{Amps}$$



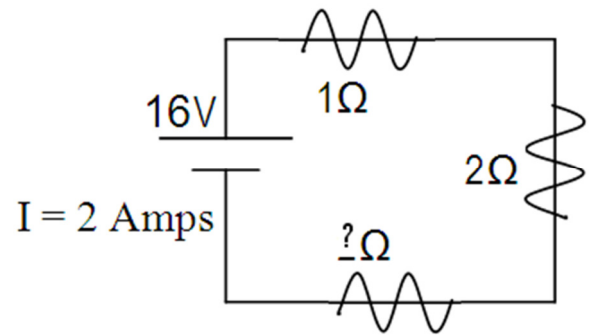
21. What is the total resistance for the circuit to the right?

$$R_T = \frac{V}{I} = \frac{16V}{2A} = 8\ \Omega$$

22. What is the value of the unknown resistor?

$$R_T = R_1 + R_2 + R_3$$

$$8\ \Omega = 1\ \Omega + 2\ \Omega + (? \ \Omega) = 5\ \Omega$$



23. What is the voltage drop through  $R_1$ ?

$$V = I \cdot R_1 = 4A \times 5\ \Omega = 20V$$

24. What is the voltage drop through  $R_3$ ?

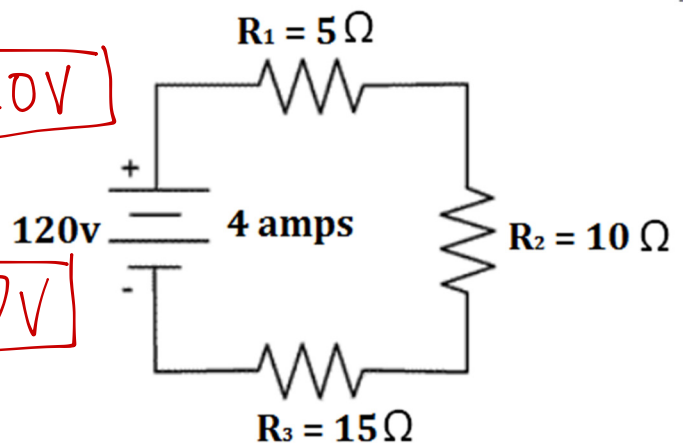
$$V = I \cdot R_3 = 4A \times 15\ \Omega = 60V$$

25. How many dry cells make up the 120 battery?

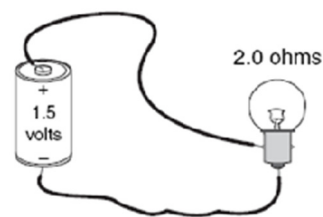
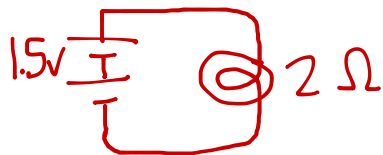
2

26. What is the  $R_T$  in this circuit?

$$R_T = R_1 + R_2 + R_3 = 5\ \Omega + 10\ \Omega + 15\ \Omega = 30\ \Omega$$



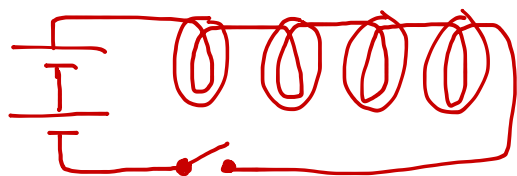
27. Draw the correct schematic diagram for the circuit shown on the right.



28. What is the current in the circuit?

$$I = \frac{V}{R} = \frac{1.5V}{2\Omega} = \boxed{0.75 \text{ Amps}}$$

29. Draw the correct schematic diagram for the circuit shown on the right.



30. If you unscrew any one bulb, what happens to the rest of the bulbs?

They turn off.

31. If you turn the switch off, how many bulbs are affected?

all four will turn off.

32. If each bulb has 2.5 Ohms of resistance, what is the  $R_T$  for the circuit?

$$R_T = R_1 + R_2 + R_3 + R_4 = 2.5\Omega + 2.5\Omega + 2.5\Omega + 2.5\Omega = \boxed{10\Omega}$$

33. If each bulb has 2.5 Ohms of resistance, and the current flowing is 2A, what is the voltage from the battery?

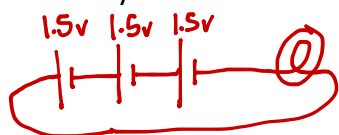
$$V = I \cdot R_T = 2A \times 10\Omega = \boxed{20V_{\text{olt}}}$$

34. Three AA batteries are connected in series to a light bulb, as pictured. If one battery provided 1.5 volts, what is the total voltage ( $V_T$ ) of the circuit?

$$V_T = 1.5V + 1.5V + 1.5V = \boxed{4.5V}$$



35. Draw the schematic diagram for the circuit using the correct circuit symbols.



over for # 36

36. If the current through the circuit is 0.5 amps, what is the resistance of the bulb?

$$R_T = \frac{V}{I} = \frac{4.5V}{0.5A} = 9\ \Omega$$