Name: KEY

Period: _____

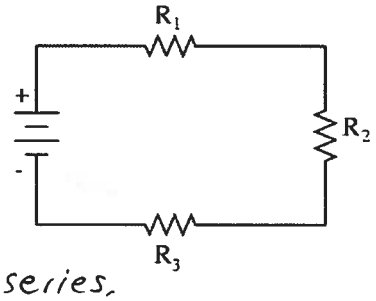
Pre-AP Physics

Due: 3/18/13

Circuit Diagram Problems

Answer each question in the space provided. Show all work and box your answer(s).

1. Three resistors are set up in series and connected to a 12-Volt power supply, as in the diagram. $R_1 = 10\Omega$, $R_2 = 5\Omega$, and $R_3 = 15\Omega$



   a. What is the total equivalent resistance of this circuit?

$R_S = R_1 + R_2 + R_3$

$= 10 + 5 + 15 = \boxed{30\ \Omega}$

   b. The current running through R_1 is 0.4 Amps. What is the total current of the circuit?

$\boxed{0.4\ \text{Amps}}$ Current is always the same for all components in series.

   c. What is the voltage drop across R_1?

$I_1 = 0.4A$ $\quad V_1 = I_1 R_1$ $\quad \boxed{V_1 = 4\ \text{Volts}}$

$R_1 = 10\Omega$ $\quad V_1 = (.4)(10)$

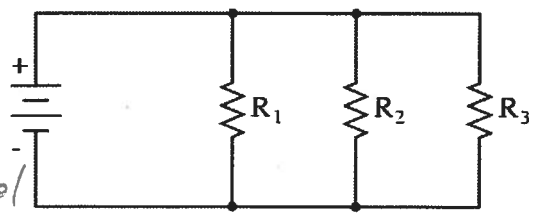
2. Three resistors are connected in parallel with a 30-Volt power supply, as in the diagram. $R_1 = 30\Omega$, $R_2 = 60\Omega$, and $R_3 = 60\Omega$

   a. What is the equivalent resistance of the whole circuit?

$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$= \frac{1}{30} + \frac{1}{60} + \frac{1}{60} \rightarrow \frac{1}{R_p} = \frac{1}{15}$

$\boxed{R_p = 15\ \Omega}$



   b. What is the voltage across R_1, R_2, and R_3?

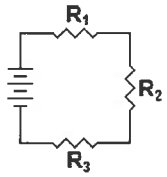
$\boxed{30\ \text{V}}$ Voltage is always the same for components in parallel

   c. What is the current through R_2?

$V_2 = I_2 R_2$

$I_2 = \frac{V_2}{R_2} \rightarrow I_2 = \frac{30}{60} = \boxed{0.5A}$

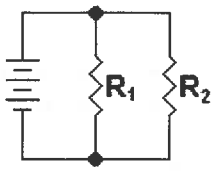
3. Fill in the table of values for each circuit.



Series

a)	V	I	R
Total	**24.0 V**	2 A	12 Ω
R_1	4 V	2 A	**2.0 Ω**
R_2	12 V	2 A	**6.0 Ω**
R_3	8 V	2 A	**4.0 Ω**

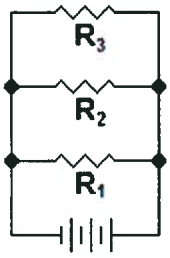
↑ all the same



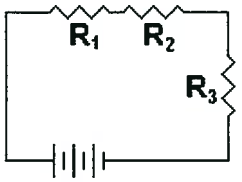
Parallel

b)	V	I	R
Total	**12.0 V**	9 A	1.33 Ω
R_1	12 V	6 A	**2.0 Ω**
R_2	12 V	3 A	**4.0 Ω**

↑ all the same



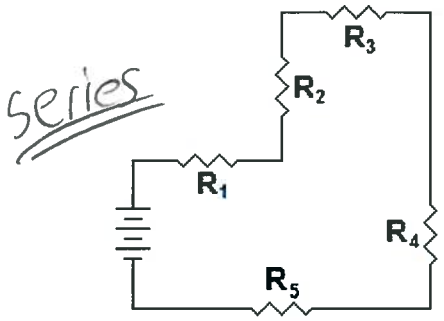
Parallel



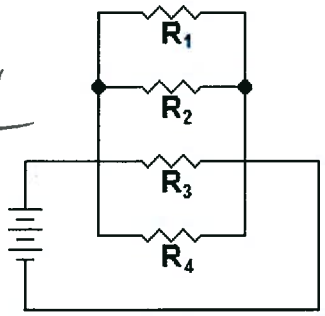
Series

c)	V	I	R
Total	36 V	6 A	6 Ω
R_1	36 V	**2.0 A**	18 Ω
R_2	36 V	**3.0 A**	**12.0 Ω**
R_3	36 V	**1.0 A**	36 Ω

d)	V	I	R
Total	36 V	2 A	18 Ω
R_1	8 V	**2.0 A**	**4.0 Ω**
R_2	12 V	2 A	**6.0 Ω**
R_3	16 V	2 A	**8.0 Ω**



series



Parallel

e)	V	I	R
Total	**60.0 V**	2 A	30 Ω
R_1	16 V	2 A	**8.0 Ω**
R_2	24 V	2 A	**12.0 Ω**
R_3	8 V	2 A	**4.0 Ω**
R_4	8 V	**2.0 A**	4 Ω
R_5	**4.0 V**	2 A	2 Ω

f)	V	I	R
Total	**24.0 V**	11.27 A	2.13 Ω
R_1	24 V	8 A	**3.0 Ω**
R_2	24 V	2.67 A	**9.0 Ω**
R_3	24 V	**0.3 A**	80 Ω
R_4	24 V	**0.3 A**	80 Ω

$$V_S = V_1 + V_2 + V_3 \ldots + V_n \qquad V_P = V_1 = V_2 = V_3 \ldots = V_n$$

$$I_S = I_1 = I_2 = I_3 \ldots = I_n \qquad I_P = I_1 + I_2 + I_3 \ldots + I_n$$

$$R_S = R_1 + R_2 + R_3 \ldots + R_n \qquad \frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots + \frac{1}{R_n}$$