Series & Parallel Circuit Class Exercises Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Round the Loop We Go!* 6/1/15**  Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hour \_\_\_\_

 NOTE: ANSWERS ARE NOT ROUNDED TO CORRECT SIGNIFICANT DIGITS.

 PURPOSE IS TO HELP YOU CHECK TO MAKE SURE NUMBERS ADD UP.

1. For each of the following series circuits, find the equivalent resistance, the total current through the battery, and the total power use. Then find the voltage drop across, and the power used by, each individual resistor.

***CHECK*** your work by making sure that the voltage drops add up to the total voltage, and that the powers for all the resistors add up to the power provided by the battery. **You will need a separate paper, unless you have very small handwriting.**

a) Series Circuit: Req=R1 + R2 = 5 Ω +3 Ω = 8 Ω



 Battery Current: I=V÷R =

 Req = 8 Ohms Ibatt = 1.5 Amperes Pbatt = 18 Watts

 V5Ω = 7.5 V P5Ω = 11.25 W

 V3Ω = 4.5 V P3Ω = 6.75 W



b)

 Req = 45 Ohms Ibatt = 0.2 Amperes Pbatt = 1.8 Watts

 V27Ω = 5.4 V P27Ω = 1.08 W

 V18Ω = 3.6 V P18Ω = 0.72 W

c)

Ω

 Req = 15 Ohms Ibatt = 0.4 Amperes Pbatt = 2.4 Watts

 V5Ω = 2 V P5Ω = 0.8 W

 V6Ω = 2.4 V P6Ω = 0.96 W

 V4Ω = 1.6 V P4Ω = 0.64 W

2. For each of the following parallel circuits, find the equivalent resistance, the total current through the battery, and the total power use. Then find the current through, and power used by, each individual resistor. For parallel paths: $\frac{1}{R\_{equivalent}}=\frac{1}{R\_{1}}+\frac{1}{R\_{2}}+\frac{1}{R\_{3}}+…$

Remember: Parallel branches just have to start and end at the same spot, and have the **same voltage across them**; they do NOT have to be physically parallel, because the shape and length of the wire do not matter in this kind of problem. (In real life, if you get really long extension cords, the resistance does start to matter, so don’t just string 40 extension cords together.)

a) Req = 1.5 Ohms Ibatt = 3 Amperes Pbatt = 13.5 Watts

 I2Ω = 2.25 P2Ω = 10.125 W

 I6Ω = 2.4 V P6Ω = 0.96 W

 REMEMBER: $\frac{1}{2}+\frac{1}{6} does NOT equal \frac{1}{8} ‼$

You must find the common denominator to add the fractions properly, (or convert to decimals and add) and then take the reciprocal of the result to get the Equivalent Resistance.

b) Req = 8 Ohms Ibatt = 15 A Pbatt = 1800 W

 I10Ω = 12 A P10Ω = 1440 W

 I40Ω = 3 V P40Ω = 360 W

c) Req = 2 Ohms Ibatt = 1.5 A Pbatt = 4.5 W

 I6Ω = 0.5 A P6Ω = 1.5 W

 I12Ω = 0.25 V P12Ω = 0.75 W

 I4Ω = 0.75 V P4Ω = 2.25 W

3. **ON ANOTHER SHEET OF PAPER:**

Redraw each complex circuit, labeling each resistor in order of increasing resistance. (Lowest = “R1”, next = “R2”, etc.) For each of the circuits, find the equivalent resistance, the total current through the battery, and the total power use. Then find the current through, the voltage drop across, and the power used by each individual resistor. You are still using the basic formulas V=IR, and P=IV. Once you know the current through a resistor, you can calculate the voltage across it.



a) Req of 50Ω,75Ω branch = 30 Ohms

 Req of whole circuit = 20Ω + 30Ω = 50 Ohms

 Ibatt = 0.5 A Pbatt = 12.5 W

 V20Ω = (0.5A)(20Ω) = 10V P20Ω = 5 W

 25V – 10V used by 20Ω resistor =

 15V remaining across other resistors

 I50Ω = 0.3 A P50Ω = 4.5 W

 I75Ω = 0.2 A P75Ω = 3 W

b)

 Req of 14Ω,10Ω branch = 24 Ohms

 Req of whole circuit = (24-1 + 8-1)-1 = 6 Ohms

 Ibatt = 1.0 A Pbatt = 6 W

 I8Ω = (6V)/(8Ω) = 0.75A P8Ω = 4.5 W

 Itop branch = (6V)/(24Ω) = 0.25A

 V14Ω = (0.25 A)(14Ω) = 3.5 V P14Ω = 0.875 W

 V10Ω = (0.25 A)(10Ω) = 2.5 V P10Ω = 0.625 W



c) Req of whole circuit = 3 Ohms

 Ibatt = 0.5 A Pbatt = 0.75 W

d) Req of whole circuit = 12 Ohms

 Ibatt = 3 A Pbatt = 36 W