Mr. Caddy’s Electrifying Help Notes

**Series**: Only one way for electricity to travel.

**Parallel**: Multiple ways for electricity to travel.

\*If something is both you treat it as both. See example below

**Series Stuff**

In a circuit remember only 1 path so **ALL AMPS MUST BE THE SAME!**

**It= I1=I2=I3….**

**Vt= V1 + V2 + V3 … (ie if it’s a 12V then all the voltometers would add up to 12V)**

**Rt= R1 + R2 + R3 … The most resistors we add the more resistance there is.** When resistors are added in series the total resistance is always larger than the largest resistor.

**Parallel Stuff**

In a circuit with lots of paths the **AMPS CHANGE AT ALL POINTS! BUT EACH PATH MUST BE THE TOTAL (the sum going into a junction HAS TO BE SAME as the amount leaving the junction).**

**It= I1+I2+I3….**

**Vt= V1 = V2 = V3**

**1 = 1 + 1+ 1**

**Rt R1 R2 R3** When resistors are added in parallel the total resistance is always smaller than

the smallest resistor.

**Both types in the same circuit YIKES!!! Heres some help!**

In combination circuits, we want to find:

• the equivalent resistance for various parts of the circuit;

• the total resistance Ro in the circuit;

• the current flow through each device in the circuit;

• the voltage gain or drop through each device in the circuit.

In performing these tasks, you will use a combination of Ohm's Law and Kirchhoff's Laws. Ohm's Law will apply for an entire circuit if the total values are used, or apply to an individual resistor if the individual values are used.

The following are the steps to use to solve a combination circuit:

1. Reduce the individual resistor networks to the equivalent of one resistor by applying the appropriate equations. You should now have only a group of series resistors. Redraw the circuit in this simplified way. Determine the missing resistances below:
2. Add these series resistors to get the equivalent of one resistor. Determine this value.
3. Find the current in the circuit using Ohm's Law.
4. Finally, work backwards through the circuit using Ohm's Law and/or Kirchhoff's Laws to find the current and voltage across each resistor.

It also helps to make a fancy table like the following to keep track of everything. You can call them the actual resistors or call them R1 etc it doesn’t matter.

R (oh) V (V) I (A)

10 \_\_\_\_ \_\_\_\_

20 \_\_\_\_ \_\_\_\_

30 \_\_\_\_ \_\_\_\_

8 \_\_\_\_ \_\_\_\_

12 \_\_\_\_ \_\_\_\_

15 \_\_\_\_ \_\_\_\_

Look at the following examples. ADD example 12 and from ultimate review

**Calculating Power**

When electric charges move through a circuit, potential energy is converted to other forms of energy. The rate at which this energy is converted is defined as the power used. As an equation,

P = ∆Ep

t

but also recall from energy unit ∆Ep = qV so P =qV

t

and, since q = I, by substitution we get **P = IV**

t

This is the general formula for power transformed by any electrical device, measured in watts (W). The rate of energy transformation in a resistance R can also be written in two other ways. By substituting Ohm’s Law:

**P = I2R and P =V2**

**R**

**Paying the Cost to Be the Boss**

Since electrical devices use electrical energy, we can find the cost of using electrical

devices. However, the basic unit of energy (the joule) is very small for this purpose,

so we use a larger unit called the kilowatt hour (kWh). The cost of electricity then is

found by:

Cost = Energy • rate

= Pt • rate

= IVt • rate