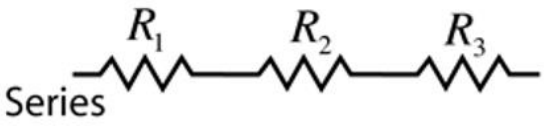
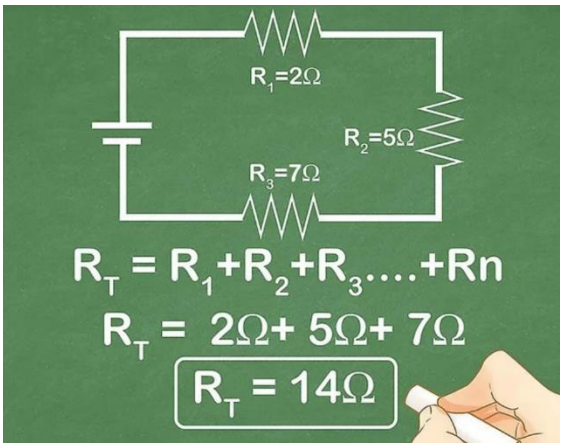
Essential Circuit Rules

RULE#1

When resistors are in series you can just **add them together** to get determine a total (or equivalent resistance

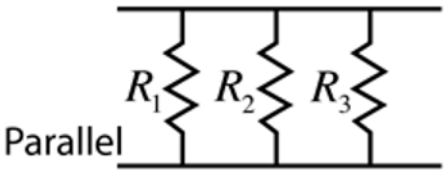


$$R_{equivalent} = R_1 + R_2 + R_3 + \ldots$$

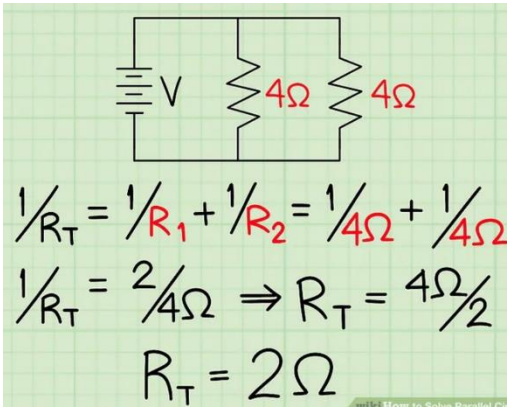


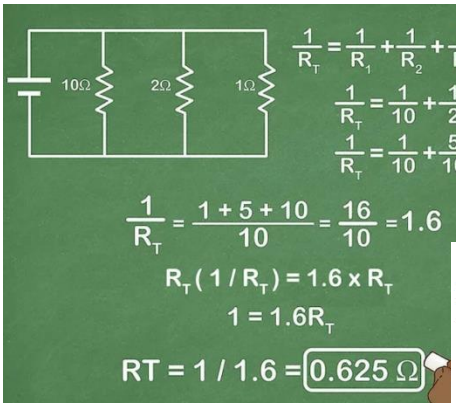
RULE#2

When resistors are placed in parallel, this will you are essentially adding paths for electrons to flow. **This will decrease the total resistance**. You can find the total (or equivalent resistance) using the following formulas:



$$\frac{1}{R_{equivalent}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$$



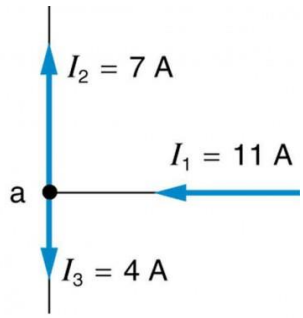


For only two resistors connected in parallel, the equivalent resistance may be found by the product of the two values divided by the sum

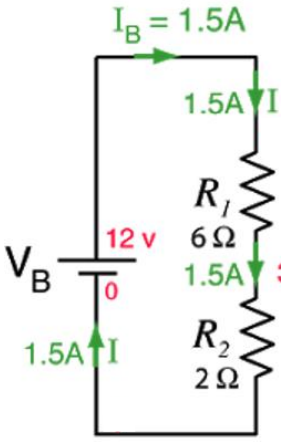
$$R_T = \frac{R_1 R_2}{R_1 + R_2}$$

RULE#3

Current in = Current out. Remember current is a flow of particles. When current comes to a juncture it splits. The total current entering the juncture must equal the total current exiting. **Conservation of mass**! This also means –no junction (or split) means no change in current.



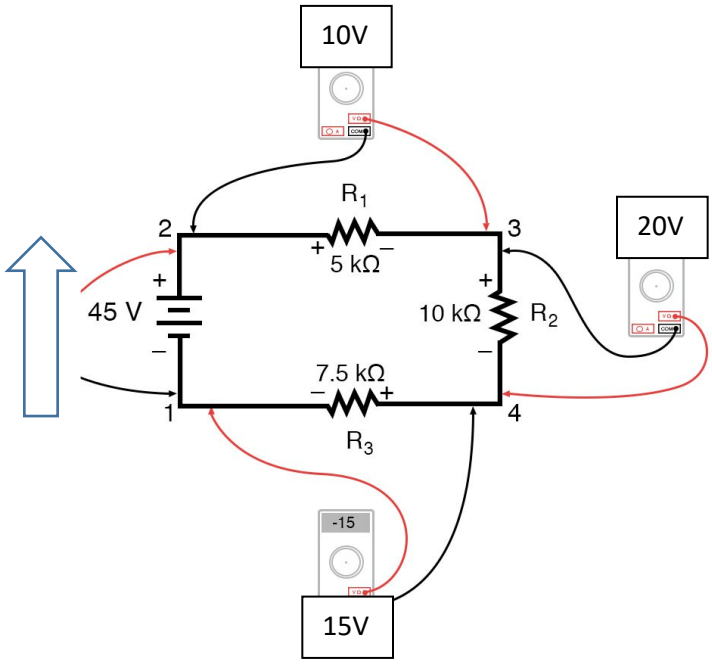
$I_1 = I_2 + I_3$



No split in this series circuit means the **current** always remains at **1.5A everywhere in the circuit.**

RULE#4

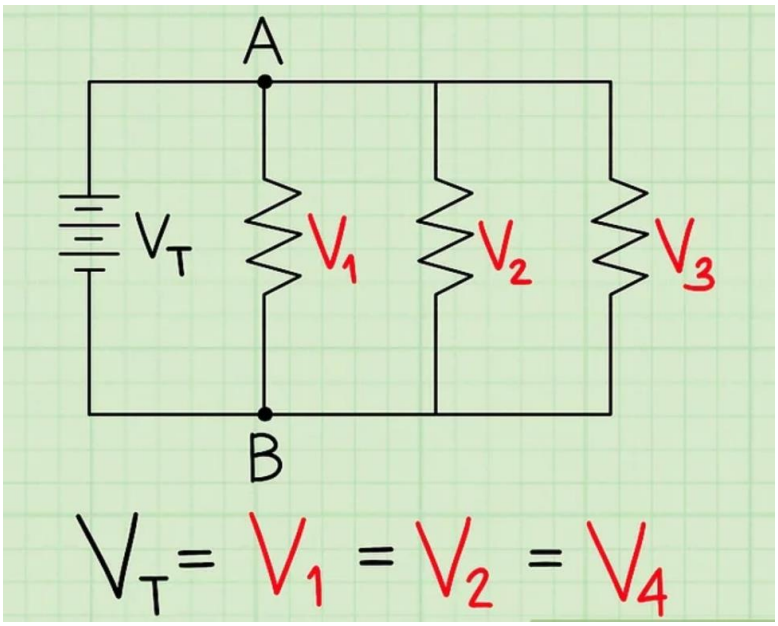
Voltage in SERIES. Remember Voltage is energy. If resister are in series, the total voltage given to the circuit by the battery (or power source) **must be equal to all the losses in the series loop. Energy in = Energy out**!



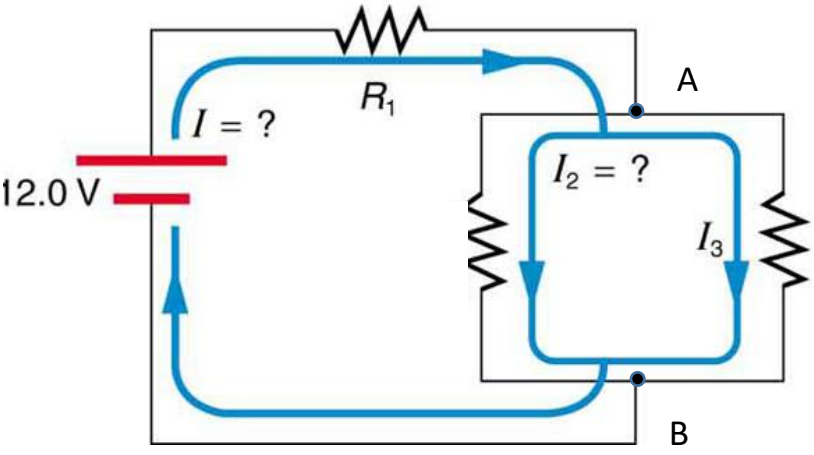
45Volts (supplied) = $V_1 + V_2 + V_3$ (all voltage lost)

RULE#5

Voltage in Parallel. Remember Voltage is **Joules PER Coulomb**. When resistors are in parallel (as shown below) the **voltage drop across any path will be the same**. Different amounts of current may flow in the different paths but (from start to finish) they all lose the same the same amount of **Joules PER COULOMB**.



$V_1 = 9V$



$V_2 = V_3 = 3V$ *(from A to B)*

Voltage drop is 3 volts ***Regardless of path taken From A to B***

3 joules per coulomb must be lost.