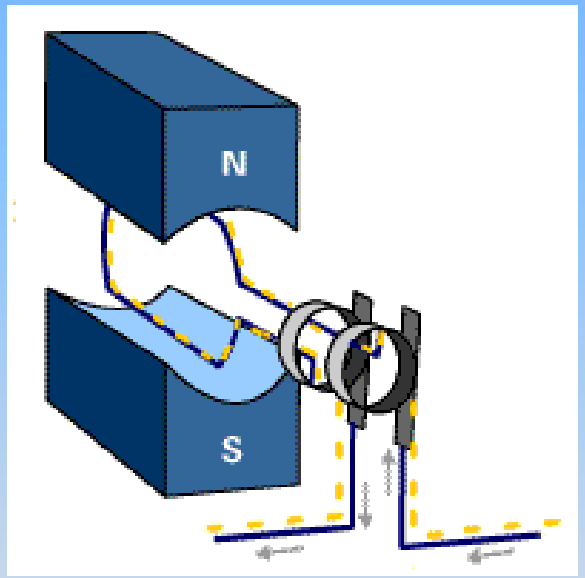
Electricity & Watt’s Law

Electricity

Electricity is the **flow of charge** around a circuit **carrying energy** from a power source to appliances/components.



Voltage –the force or pressure needed to move electrons or is the difference of potential energy that forces electrons to flow in a circuit. The unit of measure is the volt.

Current – the name given to the flow of electrons or the rate of flow of charge of electrons. Current is like the flow of water. The unit of measure is the Ampere

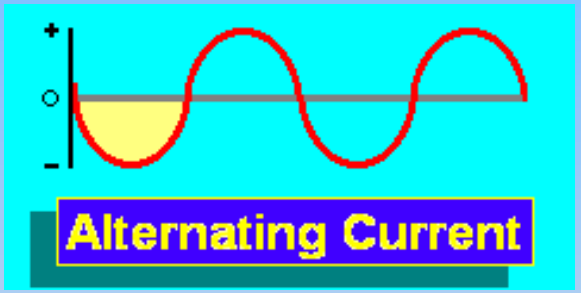
Resistance - restricts the flow of electric current. The unit of measure is the Ohm.

Alternating Current

Alternating Current is a readily available power source around the world being created by hydro systems, wind turbines, coal fired generation plants and Nuclear Reactors.

In BC, the hydro electric system (Dams) provides most of our power.

The AC produced by the generators in our hydro electric system is 117VAC @ 60Hz.



Wire Sizes

Wire can only hold so much current before is heats up and potentially fails. The chart to the right shows the amount of current for the wire size.

This chart only gives the MAXIMUM amount of current for the wire size.

However, what about the length of the wide……

Maximum Current		
AWG Wire Size	**Two Current Carrying Conductors Current**	**Three Current Carrying Conductors Current**
18	**7**	**10**
16	**10**	**13**
14	**15**	**18**
12	**20**	**25**
10	**25**	**30**
8	**35**	**40**
6	**45**	**55**
4	**60**	**70**
2	**80**	**95**

Current through Extension Cords

14 / 2 AWG Cable	
Length	Current
50'	15 A
100'	13 A
150'	8 A
200'	6 A
250'	5 A
300'	4 A

12 / 2 AWG Cable	
Length	Current
50'	15 A
100'	15 A
150'	13 A
200'	10 A
250'	7 A
300'	6 A

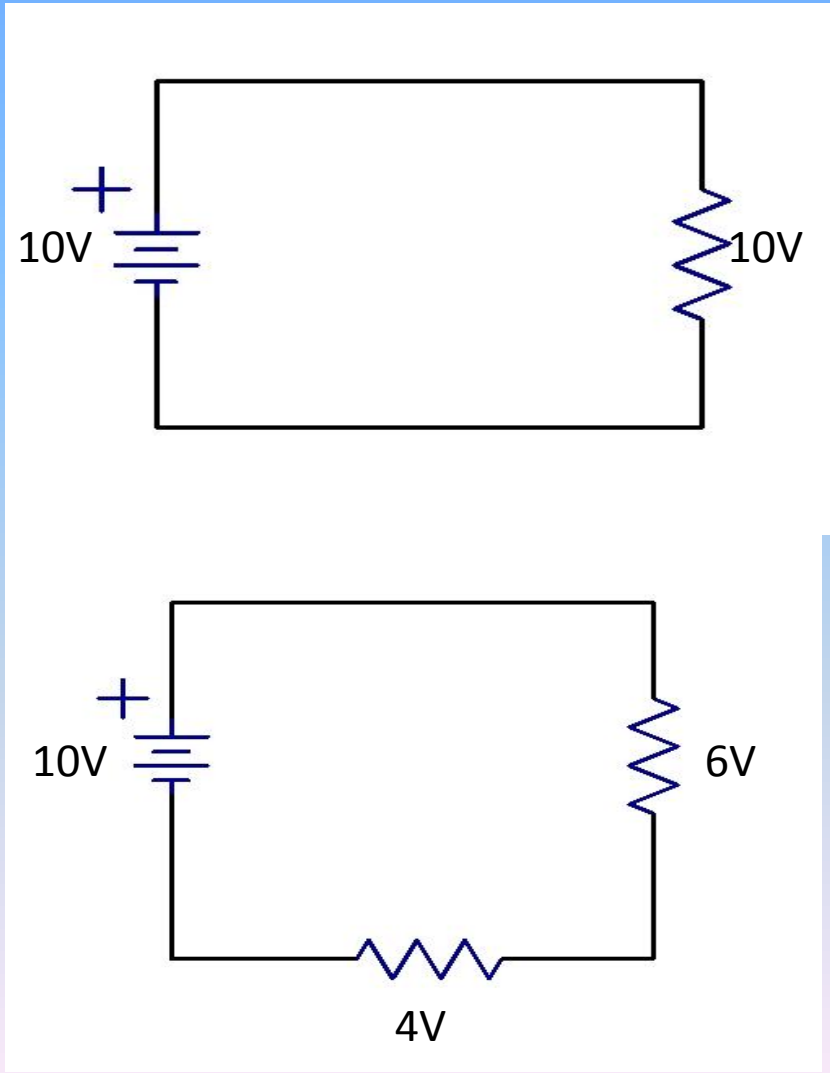
10 / 2 AWG Cable	
Length	Current
50'	15 A
100'	15 A
150'	15 A
200'	15 A
250'	13 A
300'	10 A

The rule……..

- The longer the run of wire (extension cord or in the walls) the larger the gauge of wire that will be required.

Kirchhoff's Voltage Law

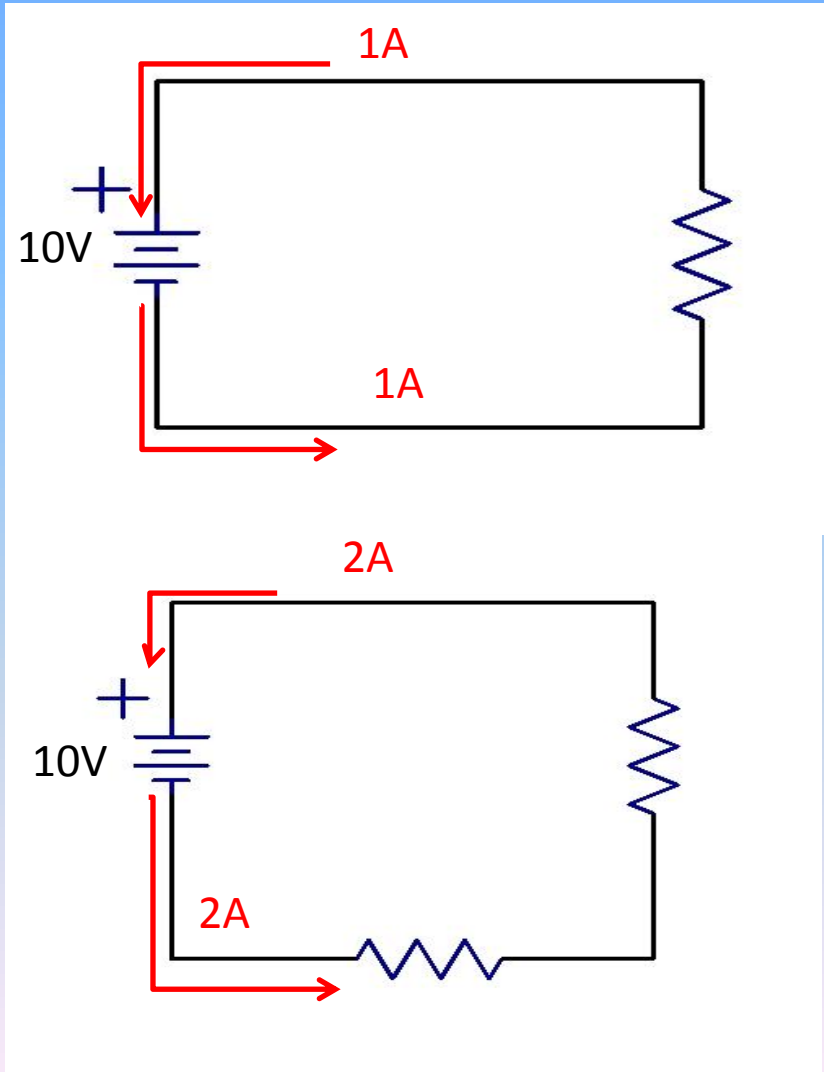
The sum of the voltage drops around a circuit is equal to the sum of the voltage source.



Kirchhoff's Current Law

The total amount of current coming out of a power source must equal the total amount going back into the power source.

Remember: Current is the flow of electricity in a circuit. The unit is the Ampere (A)

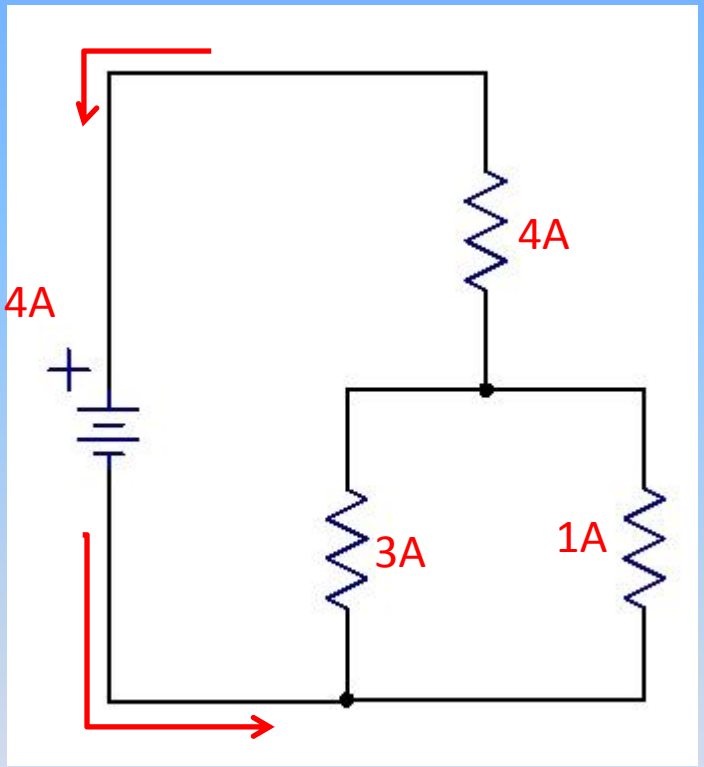


Kirchhoff's Current Law

(Applied to series and parallel circuits con't)

Series/Parallel Circuits

In a circuit that is comprised of both series and parallel, the current remains the same through a series path, divides up through the parallel path depending on the resistance of each path, then goes back together.



Watt’s Law

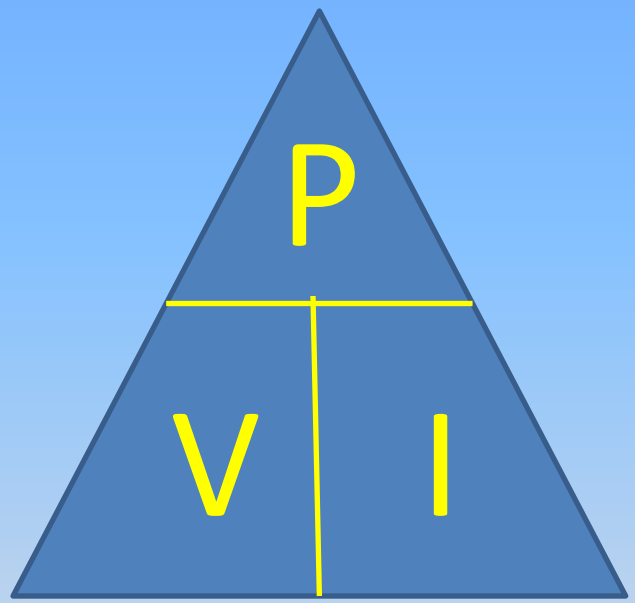
Watt's Law

- When electricity is being used by a load (Light, motor, toaster, etc), the electrical energy is being converted into another form (light, motion, heat).

- **Power** is the amount of electrical energy being converted by a load. The unit of measure is the Watt.

Calculating Power;

$$P = V \times I$$



P = Watts, V = Voltage, I = Current

Watt's Law Continued

Examples

You have a voltage of 120v and a current of 2A, what amount of power is being consumed?

P = V x I

P = 120V x 2A

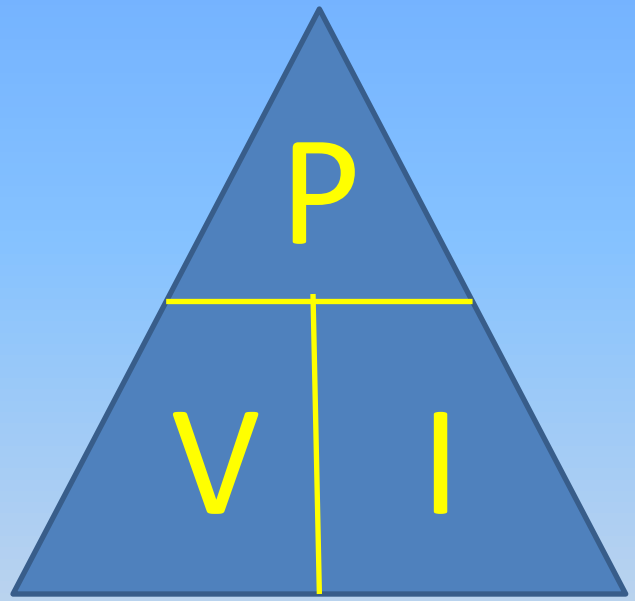
P = 240W

You have a light bulb that is 60W in your house (120v). How much current is the light bulb drawing?

I = P / V

I = 60W / 120V

I = .5A



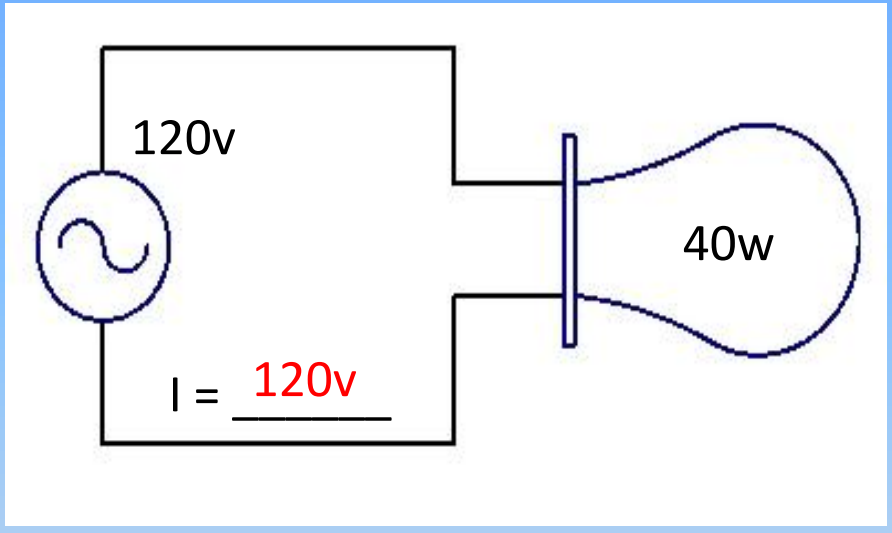
P = Watts, V = Voltage, I = Current

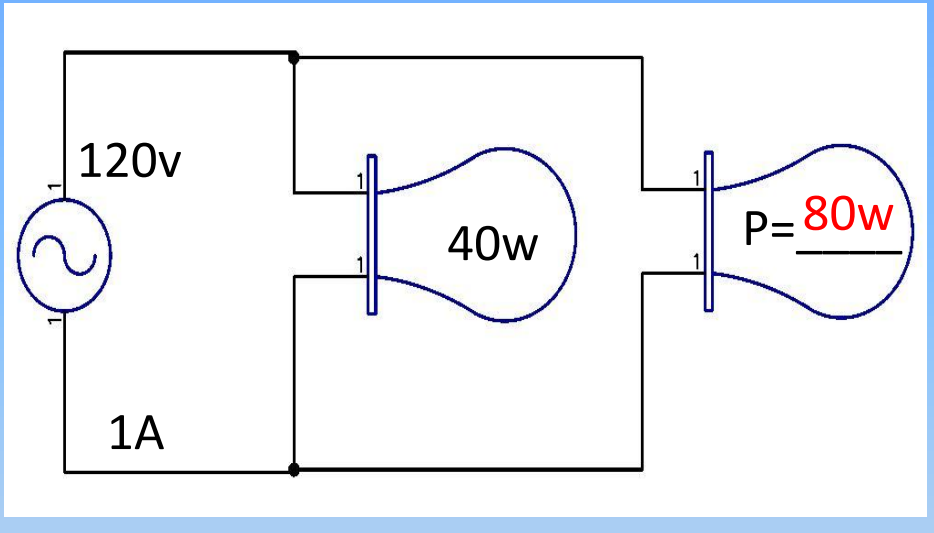
$$P = V \times I$$

$$I = P / V$$

$$V = P / I$$

Watts Law - Examples





P = V x I

I = P / V

I = 40w / 120v

I = .33w

P = V x I

P = 120v x 1A

P = 120w

120w – 40w = 80w

Watt’s Law Assignment