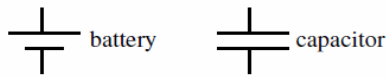
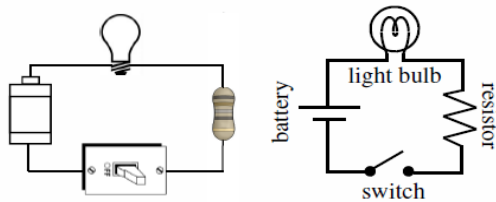


**Types of Circuits**

Circuit diagrams are a short-cut method of drawing circuits. They don't need to be perfect, but they can be drawn wrong.



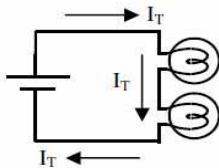
These components look similar, but are very different and have different functions.



The diagram on the right is a faster way of drawing the circuit on the left. (Notice the direction of the battery, which is important.)

Electrical Symbols			
Electrical Device	Symbol	Function	Water Equivalent
wire	—	path for electricity to flow	pipes
battery		pushes electricity through circuit	pump
light bulb		makes lights; resists electricity	water wheel
switch		turns electricity on and off	valve
resistor		resists flow of electricity.	restriction in a pipe

**Series circuits** have only one path for the electricity to flow. There are no junctions.



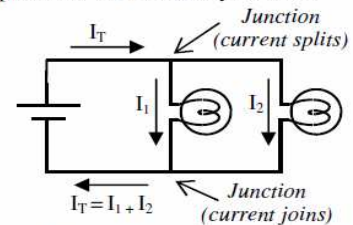
The current is the same everywhere in a series circuit.

If any part of a series circuit is broken, the circuit fails. The lights are dependent on one another: if either light is unscrewed both lights will turn off.

**Series versus Parallel**

The branches (paths) of a parallel circuit are independent: if one light is unscrewed, the other will stay on.

**Parallel circuits** have multiple paths for the electricity to flow.



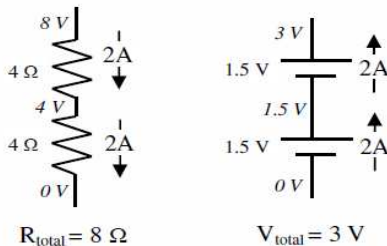
The total current equals the sum of the two branch currents.

Your house is wired in parallel, so that each light and appliance can be turned on and off independently.

**Multiple Devices**

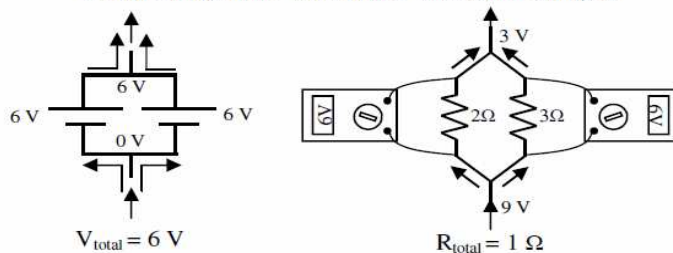
When adding together batteries or resistors, it depends whether they are in series or in parallel.

**Objects in series have the same current** because there is only one path.



Resistors and batteries in series add together.

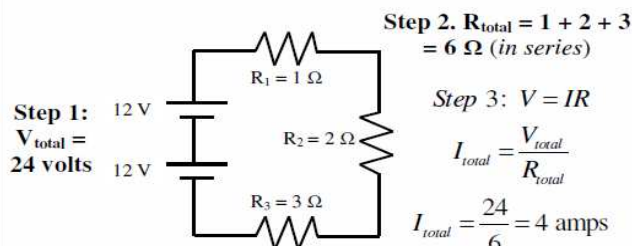
**Objects in parallel have the same voltage** because they share wires (same wire: same voltage).



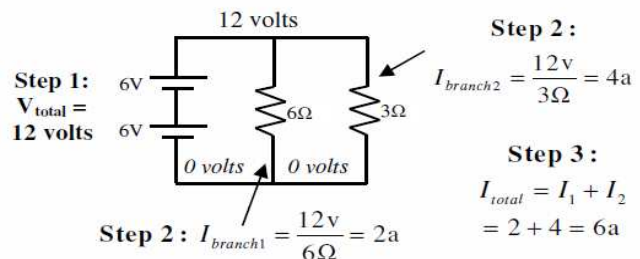
Batteries in parallel share the same voltage (they just last longer).

Resistors in parallel reduce total resistance because there are more paths for the current to flow.

**Example 1: Find the total current in this series circuit.**



**Example 2: Find the total current in this circuit.**



1. Series	A. The voltage across any wire.
2. Short Circuit	B. A circuit with multiple paths for current to flow.
3. Parallel	C. Where current splits or joins.
4. Branch	D. An independent path for electricity in a parallel circuit.
5. Junction	E. When a wire by-passes a part of a circuit.
6. Zero	F. A circuit with only one path for the electricity.

1. $R_1$	A. Voltage between A and B.
2. $V_T$	B. The total voltage in the circuit.
3. $I_T$	C. The resistance of resistor 1.
4. $V_2$	D. The current in branch 2 of the circuit.
5. $I_2$	E. Total current in the circuit.
6. $R_T$	F. The voltage of battery 2.
7. $V_{AB}$	G. The total resistance of the circuit.

*Series or Parallel Circuit?*

\_\_\_ Only one path for the electricity to flow.

\_\_\_ Paths are dependent on each other (one affects the other).

\_\_\_ How your house is wired.

\_\_\_ Paths are independent of each other.

\_\_\_ If one light turns off, the others stay on.

\_\_\_ If you turn off one light, all the lights turn off.

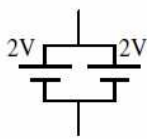
\_\_\_ Has more than one path for the electricity to flow.

\_\_\_ Two devices have the same current.

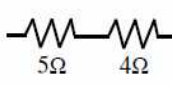
\_\_\_ Two devices have the same voltage.

*Are these devices in Series or Parallel?*

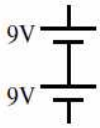
A. \_\_\_\_\_ B. \_\_\_\_\_ C. \_\_\_\_\_ D. \_\_\_\_\_



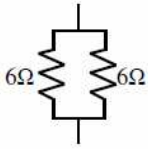
$V_T = \underline{\hspace{2cm}}$



$R_T = \underline{\hspace{2cm}}$

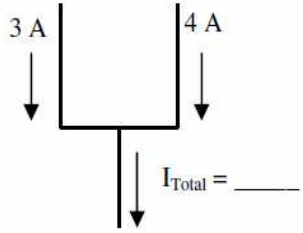


$V_T = \underline{\hspace{2cm}}$

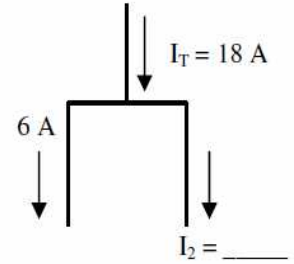


$R_T = \underline{\hspace{2cm}}$

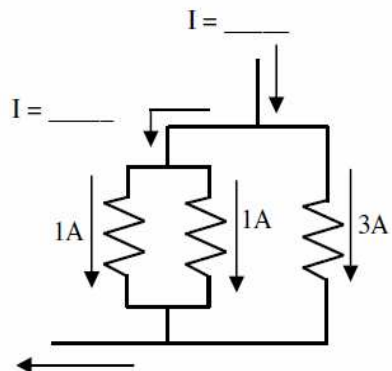
*Understanding current.*  
Fill in the missing information on the following graphics.



$I_{Total} = \underline{\hspace{2cm}}$

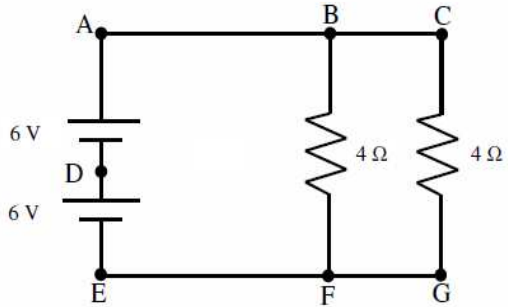


$I_2 = \underline{\hspace{2cm}}$



$I = \underline{\hspace{2cm}}$

$I_{Total} = \underline{\hspace{2cm}}$



$V_T = \underline{\hspace{2cm}}$

$V_{FG} = \underline{\hspace{2cm}}$

$V_{ED} = \underline{\hspace{2cm}}$

$V_{AB} = \underline{\hspace{2cm}}$

$V_{FB} = \underline{\hspace{2cm}}$

$V_{AC} = \underline{\hspace{2cm}}$

$V_{EA} = \underline{\hspace{2cm}}$

$V_{CE} = \underline{\hspace{2cm}}$

$V_{DC} = \underline{\hspace{2cm}}$

- A) What is the total voltage above?
- B) What is the voltage from B to F?
- C) What is the resistance from B to F?
- D) Find the current flowing from B to F (label it on the diagram).
- E) How much current flows from C to G (label it)?
- F) So, using D and E above, what is the total current going thru point E (this is the total current [ $I_T$ ])?
- G) Using  $V_T$  and  $I_T$ , find the total resistance of the circuit [ $R_T$ ].

Which resistor will have more current running thru it?

Why?

Which light bulb will be brighter?

