Name: ____________________

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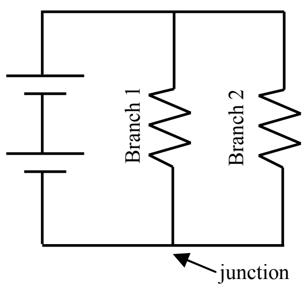
V, R, and I in Parallel Circuits

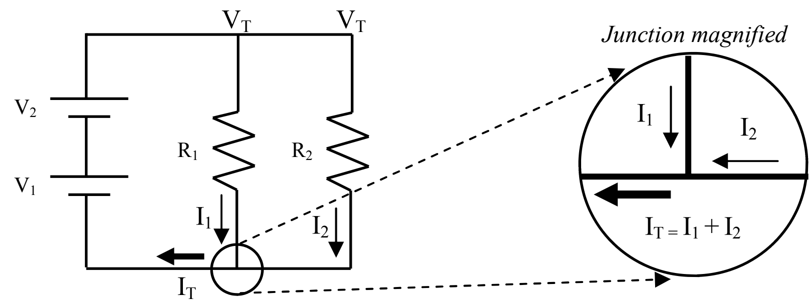
Parallel Circuits Basics

Parallel circuits have independent paths. We call these independent paths "branches".



Since wires use no voltage, we know that both branches have the same voltage.

Also, we know that all the current coming into a junction must go out.



I_T in a Parallel Circuit

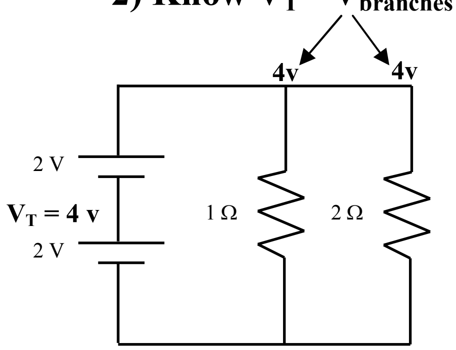
Follow these steps to find Total Current (I_T)

1) Find V_T

These batteries are in series, so you add them together.

$V_T = V_1 + V_2 = 4V$

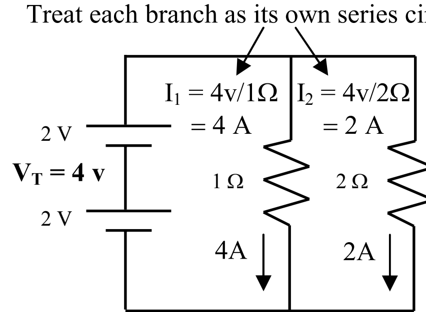
2) Know $V_T = V_{branches}$



3) Find I in each branch:

Treat each branch as its own series circuit.

Use Ohm's Law: I = V/R



$I_T = I_1 + I_2 = 6$ A

Add the branch currents together to get the total current.

4) Find Total Current (I_T)

Going farther 5) Finding Total Resistance (R_T)

Once you know V_T and I_T, you can find R_T by Ohm's Law:
If V = IR, then R = V/I. R = 4v/6A = 2/3 Ω = 0.67 Ω.

Electrical Power

Electrical Power:

Power (in *watts*) → **P = VI** ← Voltage (in *volts*), Current (in *amps*)

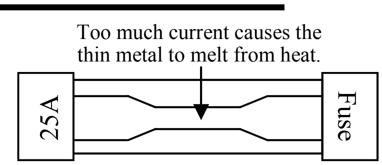
Power equals the voltage times the current.

This equation gives us the same *watts* as P = W/t. How? First you have to know that V = Joules/Coulomb and I = Coulombs/Second. Canceling out units gives us:

$$P = VI = \frac{\text{Joules}}{\cancel{\text{Coulombs}}} \times \frac{\cancel{\text{Coulombs}}}{\text{Second}}$$

$$= \frac{\text{Joules}}{\text{Second}} = \frac{W}{T} = \textbf{\textit{Power}}$$

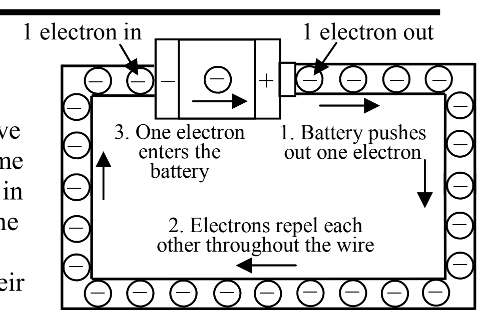
Fuses



Electricity cause heat. *Fuses melt* (or break) when too much current passes through it, protecting expensive electronic equipment. Circuit breakers protect against too much current like fuses, but can be reset.

Electrons

The electrons that move to make electricity come mostly from the wires in the circuit, not from the battery. Metals are conductors because their electrons can move.



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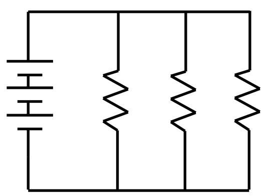
1. Fuse	A.	An independent path in a parallel circuit.
2. Circuit breaker	B.	A device that breaks to protect against excessive current. Must be replaced.
3. Wire	C.	Where branches joint or split.
4. Branch	D.	Protects against high current, but can be reset.
5. Power	E.	Where most of the electrons in a circuit come from.
6. Junction	F.	The product of voltage and current.

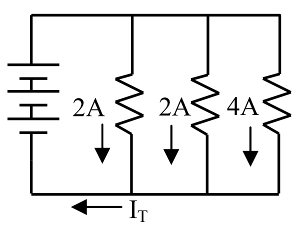


How many branches does this circuit have?

Label them: B_1, B_2, B_3.

How many junctions does it have?

Circle every junction.

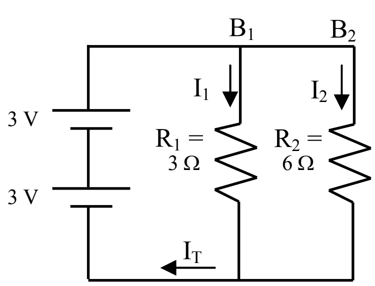


What do we know about the voltage across each branch?

Find the total current in this circuit. I_T =

How much power is used by a 120 V circuit using 6 amps?

A 240 volt circuit has 20 amps flowing through it. How much power is it using?



Series or parallel?

V_T = ________

$V_{Branches}$ = ________

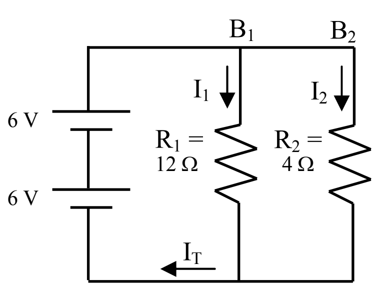
I_1 = ________

I_2 = ________

I_T = ________

R_T = ________

P = ________



Series or parallel?

V_T = ________

$V_{Branches}$ = ________

I_1 = ________

I_2 = ________

I_T = ________

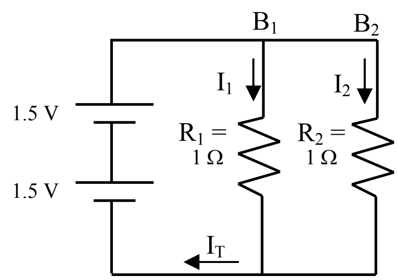
R_T = ________

P = ________

35 amps of current goes through a 40 amp fuse. What happens?

25 amps of current goes through a 15 amp fuse. What happens?

How many amps will a 60 watt light bulb use if your house is 120 volts?



Series or parallel?

V_T = ________

$V_{Branches}$ = ________

I_1 = ________

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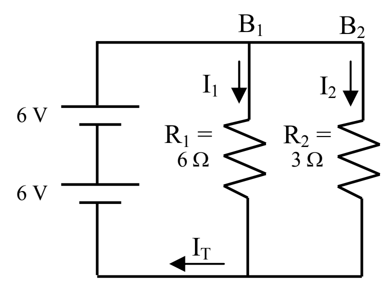
I_T = ________

R_T = ________

P = ________



Series or parallel?

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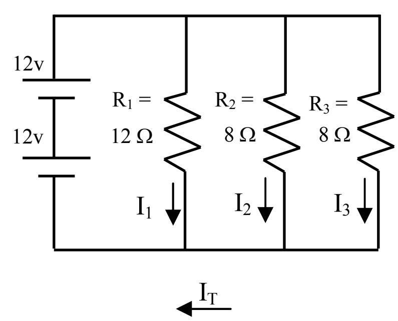


V_T = ________

$V_{Branches}$ = ________

I_1 = ________

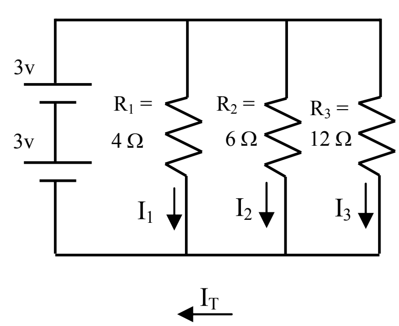
I_2 = ________

I_3 = ________

I_T = ________

R_T = ________

P = ________



V_T = ________

$V_{Branches}$ = ________

I_1 = ________

I_2 = ________

I_3 = ________

I_T = ________

R_T = ________

P = ________

Name: ____________________

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In the Lab

Starting circuit: One battery, 2 light bulbs in parallel; switch. What is the voltage across the battery? What is the voltage across light bulb 1? What is the voltage across light bulb 2?	Circuit 3: Battery, light bulb, switch, variable resistor (called a potentiometer). Turn the resistor back and forth. How does it work? When the light is bright, is the there a lot of resistance or a little resistance?
Circuit 2: Two batteries, 2 light bulbs in parallel; switch. What is the voltage across the battery? What is the voltage across light bulb 1? What is the voltage across light bulb 2?	Name three devices in your life that use potentiometers. When a potentiometer turns an device