L: Solve Combined Circuits in One-Step
Level 6
Prerequisite: Solve Complete Circuits with Nontraditional Information
Points To:

Objectives

- Solve for the voltage, current, resistance, and power of each element of a circuit that combines series and parallel elements.

- Use the “accordion method” of creating simpler circuits and using them to understand more complicated circuits.

- Use the formulas for combining resistance in series and parallel. (Especially practice the fractions in the parallel circuit formula!)

Limits:
- All of the circuits have only one step of simplification. They are only series in parallel or parallel in series, never any more complicated circuit.

-Every circuit has only one battery.

- Information provided is always the voltage of the battery

Step 1:
Combine the resistors using the correct formula until you have a simple circuit.

Equivalent Resistance for a Series Circuit	**Equivalent Resistance for a Parallel Circuit**
$R_s = R_1 + R_2 + R_3$	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

Step 2:
Solve the simple circuit.

Step 3:
Go upward to each complex circuit, one at a time. In each case, follow the rule for separating resistors.

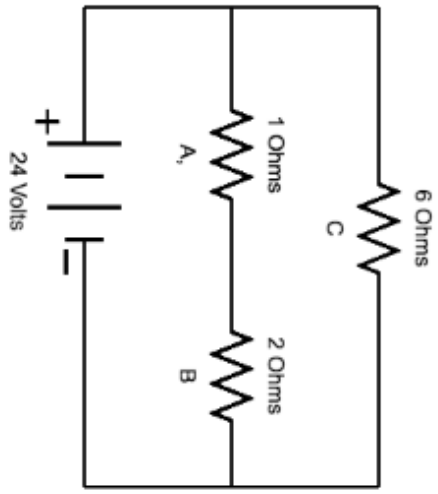
Rule for separating two resistors in series	Rule for separating two resistors in parallel.
Two resistors in series *always have the same current*.	Two resistors in parallel *always have the same voltage (potential difference)*.

Step 4:
Solve each more complex circuit as you reach it.
Repeat.

Step 5:
Use the information you have compiled to answer the final question:

Problem 1:
Using the table below, find the power dissipated by each individual resistor and the total circuit:

Original Circuit



V				
I				
R				
P				

Simpler Circuit

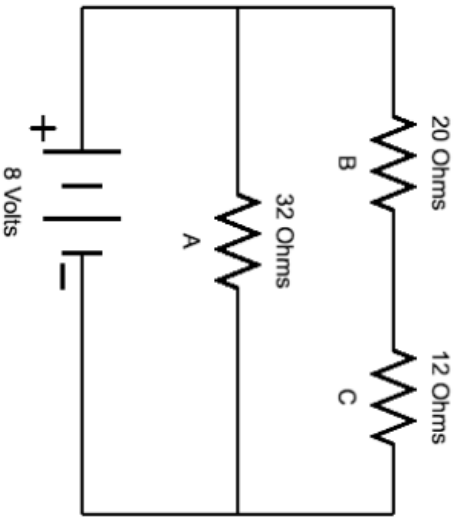
V			
I			
R			
P			

Final Answer:

	Resistor A	Resistor B	Resistor C	Total Circuit
Power (Watts)				

Problem 2: Using the table below, find the power dissipated by each individual resistor and the total circuit:

Original Circuit



V				
I				
R				
P				

Simpler Circuit

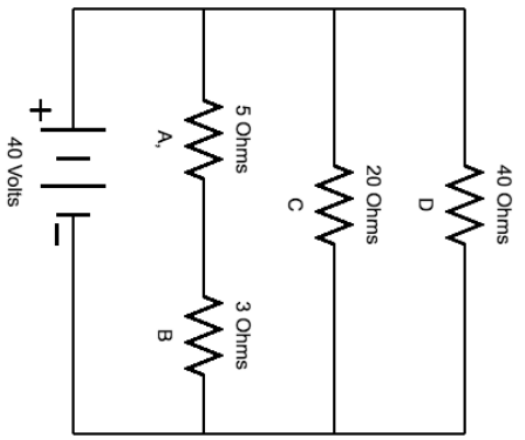
V			
I			
R			
P			

Final Answer:

	Resistor A	Resistor B	Resistor C	Total Circuit
Power (Watts)				

Problem 3: Using the table below, find the power dissipated by each individual resistor and the total circuit:

Original Circuit



V						
I						
R						
P						

Simpler Circuit

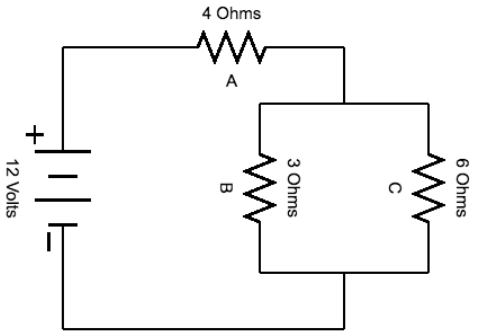
V				
I				
R				
P				

Answer the final question

	Resistor A	Resistor B	Resistor C	Resistor D	Total Circuit
Power (Watts)					

Problem 4: Using the table below, find the power dissipated by each individual resistor and the total circuit:

Original Circuit



V				
I				
R				
P				

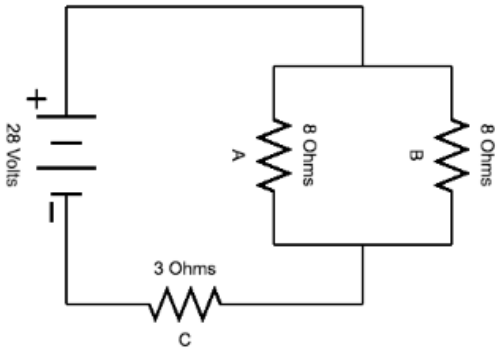
Simpler Circuit

V			
I			
R			
P			

	Resistor A	Resistor B	Resistor C	Total Circuit
Power (Watts)				

Problem 4:
Using the table below, find the power dissipated by each individual resistor and the total circuit:

Original Circuit



V					
I					
R					
P					

Simpler Circuit

V					
I					
R					
P					

	Resistor A	Resistor B	Resistor C	Total Circuit
Power (Watts)				

Answers

1.

	Resistor A	Resistor B	Resistor C	Total Circuit
Power (Watts)	64	128	96	288

2.

	Resistor A	Resistor B	Resistor C	Total Circuit
Power (Watts)	2	1.25	0.75	4

3.

	Resistor A	Resistor B	Resistor C	Resistor D	Total Circuit
Power (Watts)	125	75	80	40	320

4.

	Resistor A	Resistor B	Resistor C	Total Circuit
Power (Watts)	48	32	32	112

One-Step Accordion Problem Template

Original Circuit		V				
		I				
		R				
		P				
Simpler Circuit		V				
		I				
		R				
		P				

Alternative one-step accordion method template

Original Circuit					
	V				
	I				
	R				
	P				
Simpler Circuit	V				
	I				
	R				
	P				