

SERIES AND PARALLEL CIRCUITS

Opening

- What is Voltage, current, and resistance?
- How are they related?

Series Circuits

Voltage: adds together

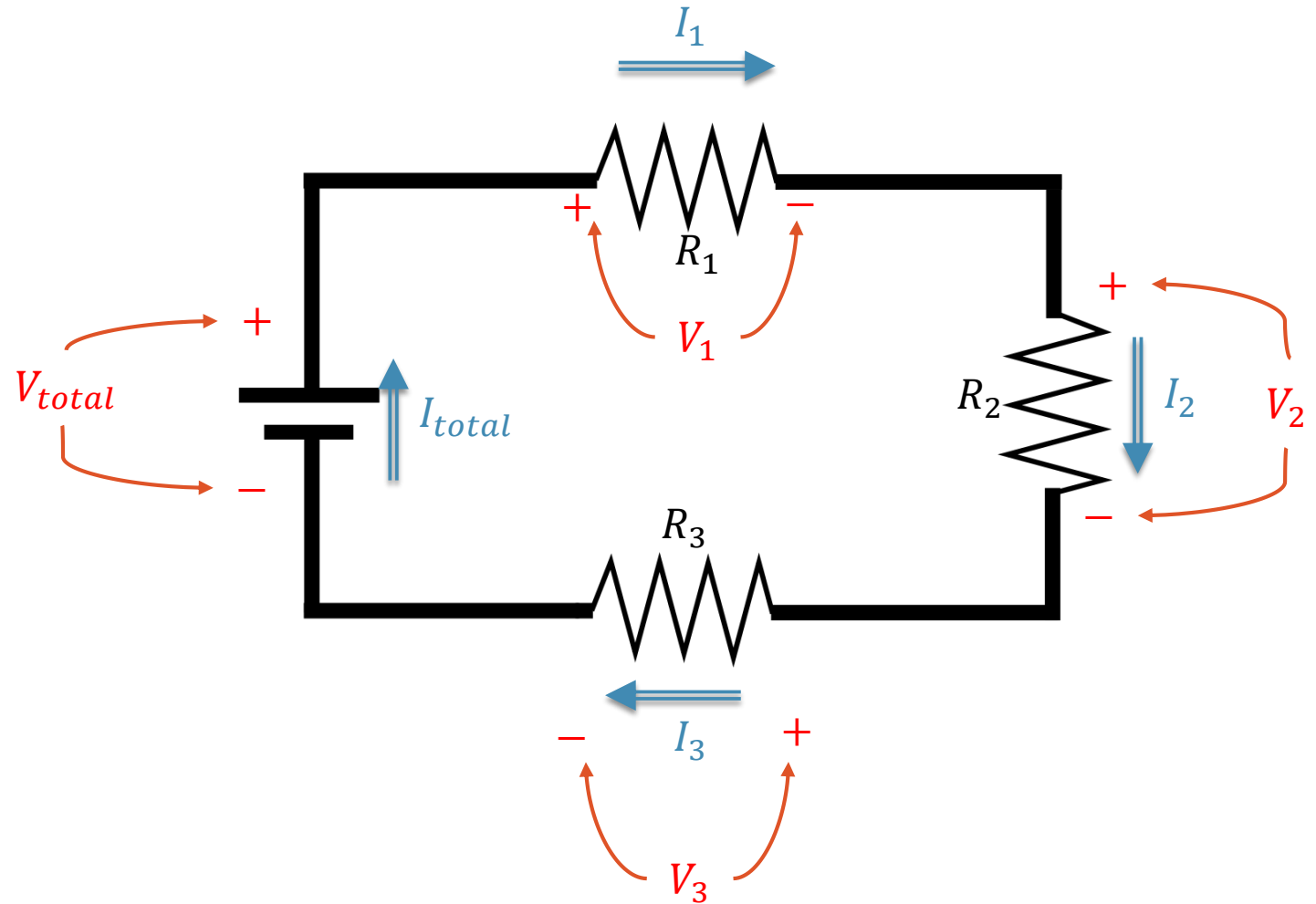
$$V_{total} = V_1 + V_2 + V_3$$

Current: All the same

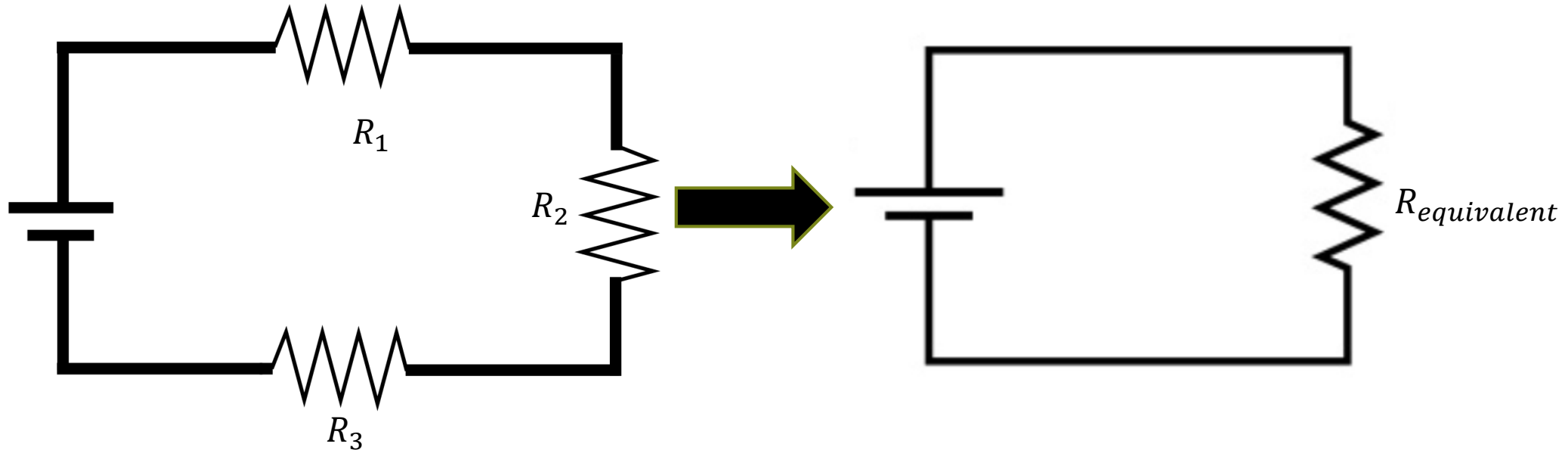
$$I_{total} = I_1 = I_2 = I_3$$

Resistance: adds together

$$R_{total} = R_1 + R_2 + R_3$$



Simplifying a series circuit



Parallel Circuits

Voltage: All the same

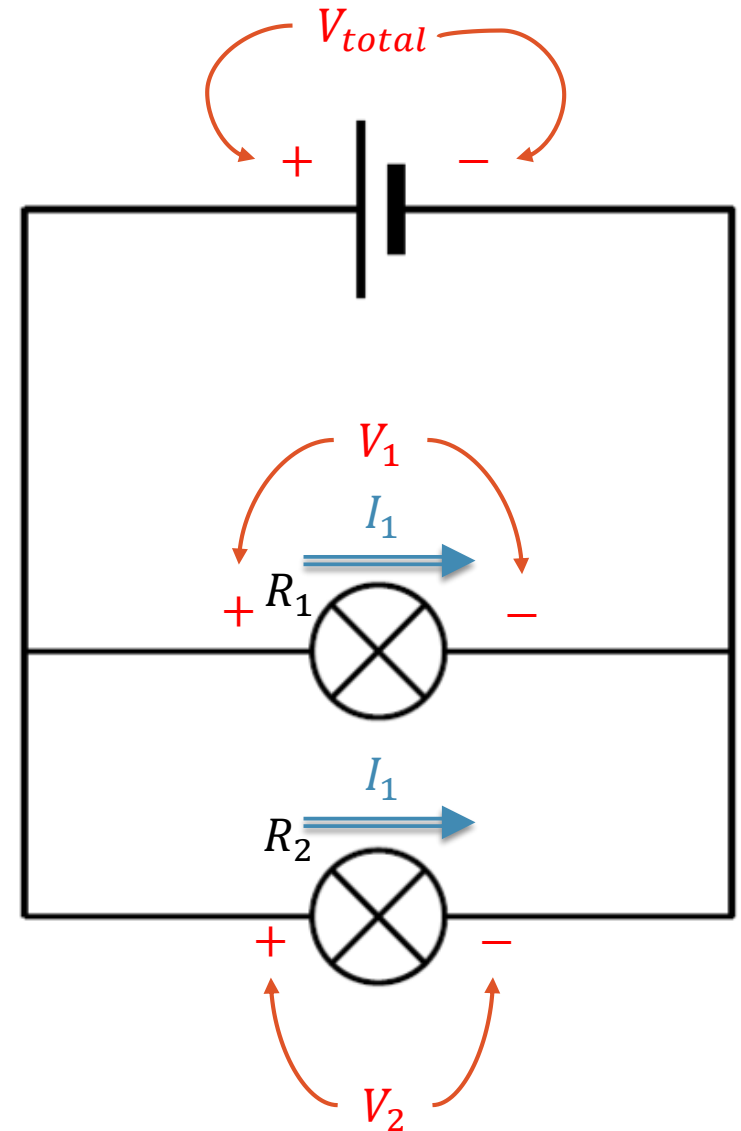
$$V_{total} = V_1 = V_2$$

Current: Divided between each "branch"

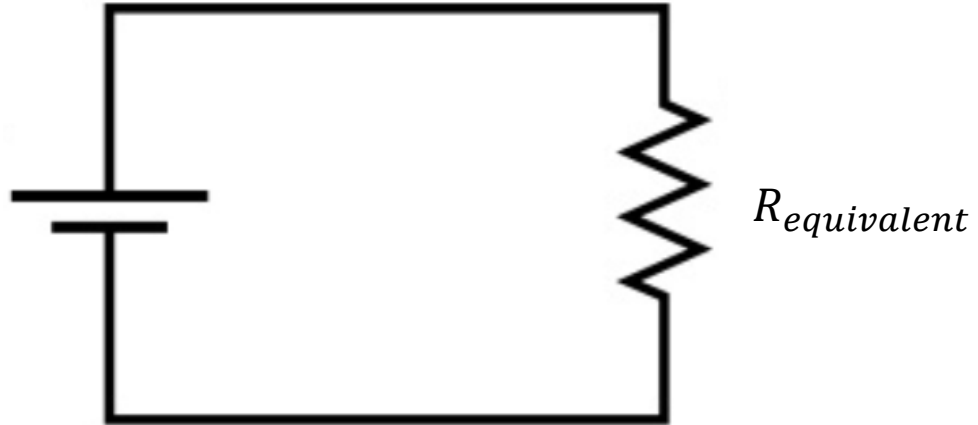
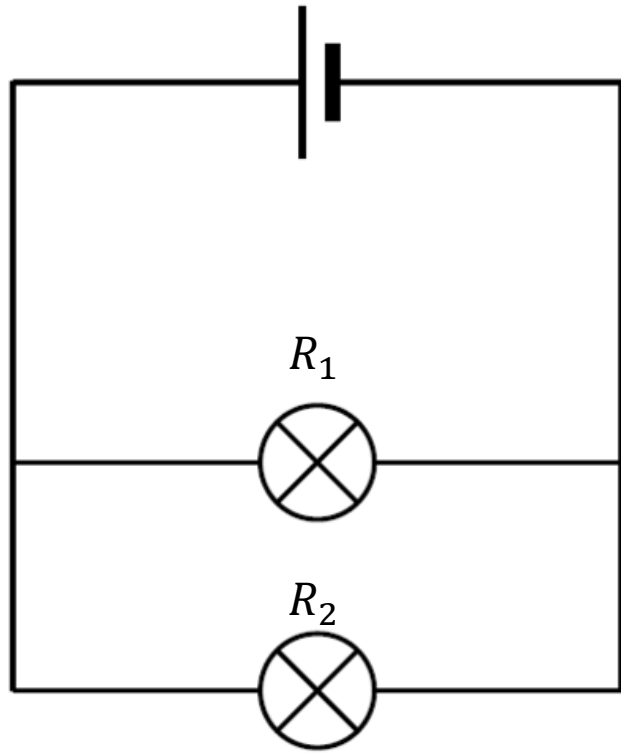
$$I_{total} = I_1 + I_2$$

Resistance: reduces total resistance

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2}$$



Simplifying a Parallel Circuit



Understanding the difference between Series and Parallel

Series

- Voltage adds
- Constant current
- Resistance adds



- Think of water flowing through a hose
 - Water passing through one point needs to pass all points (constant current)
 - The longer the hose the more resistance (resistance adds)

Parallel

- Voltage constant
- Current splits
- Resistance lessens



- Think of water flowing through a hose that splits into two hoses
 - At the split, less water flows into each hose (current splits)
 - Adding more hoses in parallel decreases the resistance (resistance lessens)

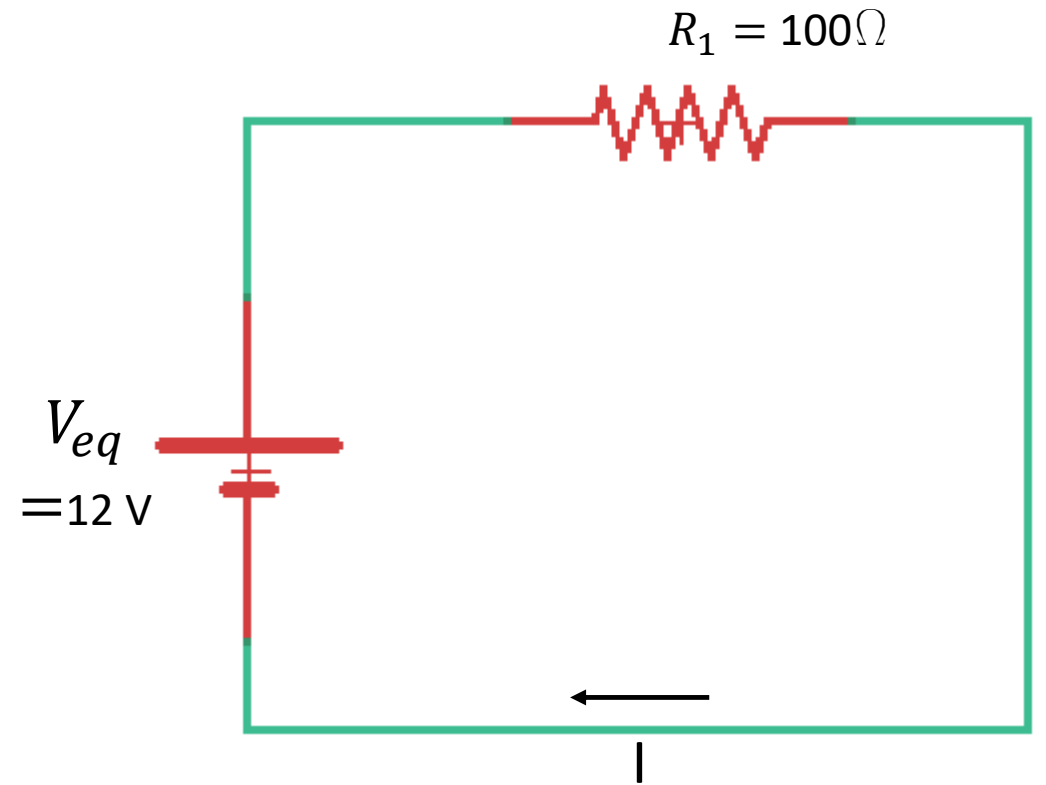
MORE SERIES AND PARALLEL CIRCUITS

Wheeler HS Fall 2019

Basic Circuit

$$V = IR$$

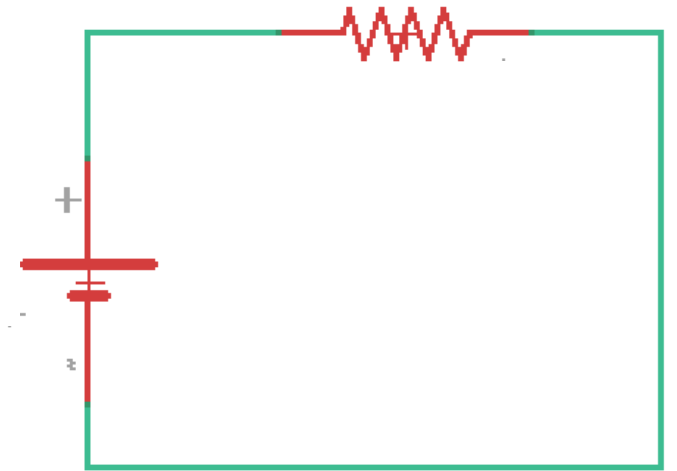
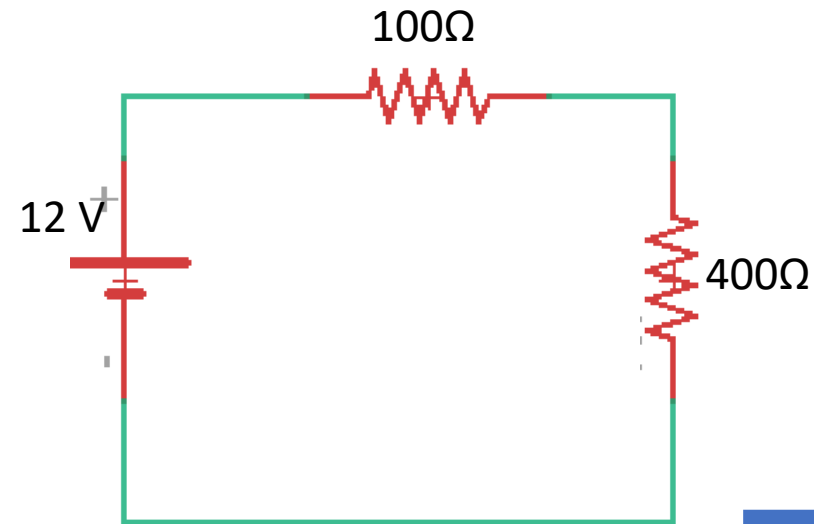
Voltage	Current	Resistance
$V_1 =$	$I_1 =$	$R_1 =$
$V_{eq} =$	$I_{eq} =$	$R_{eq} =$



Simplifying Series

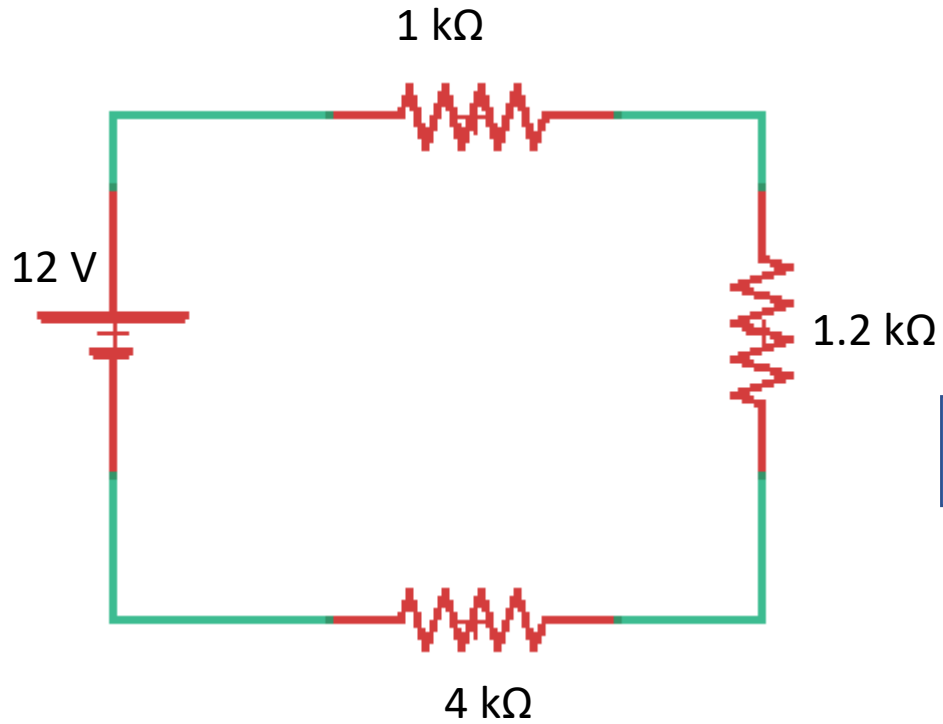
Equivalent resistance for series circuits adds together

$$R_{total} = R_1 + R_2 + \dots$$



Voltage	Current	Resistance
$V_1 =$	$I_1 =$	$R_1 =$
$V_2 =$	$I_2 =$	$R_2 =$
$V_{eq} =$	$I_{eq} =$	$R_{eq} =$

Another Series Example



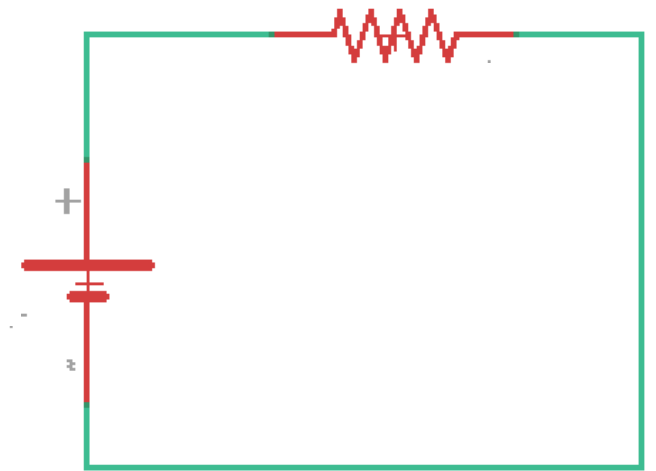
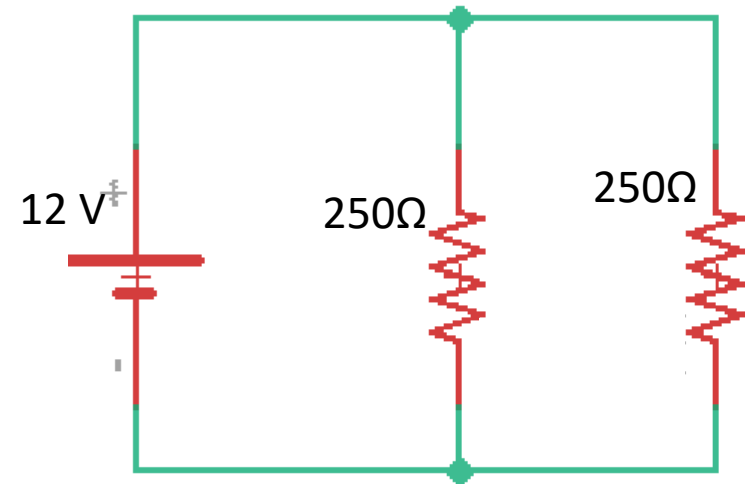
Find the equivalent resistance of this circuit



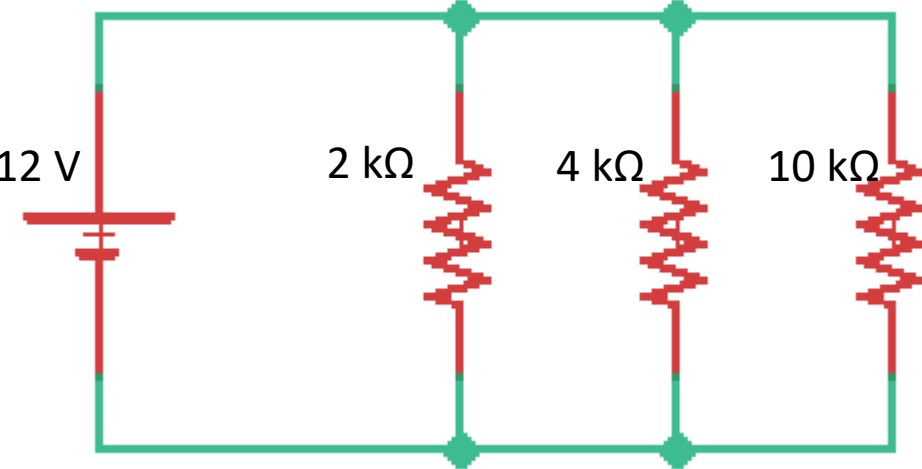
Simplifying Parallel

Equivalent resistance for parallel circuits:

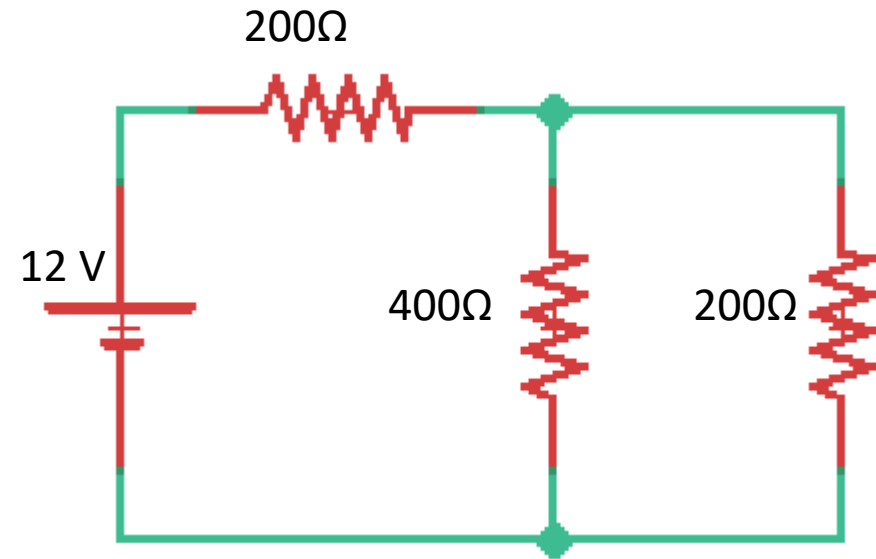
$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$



Another Parallel

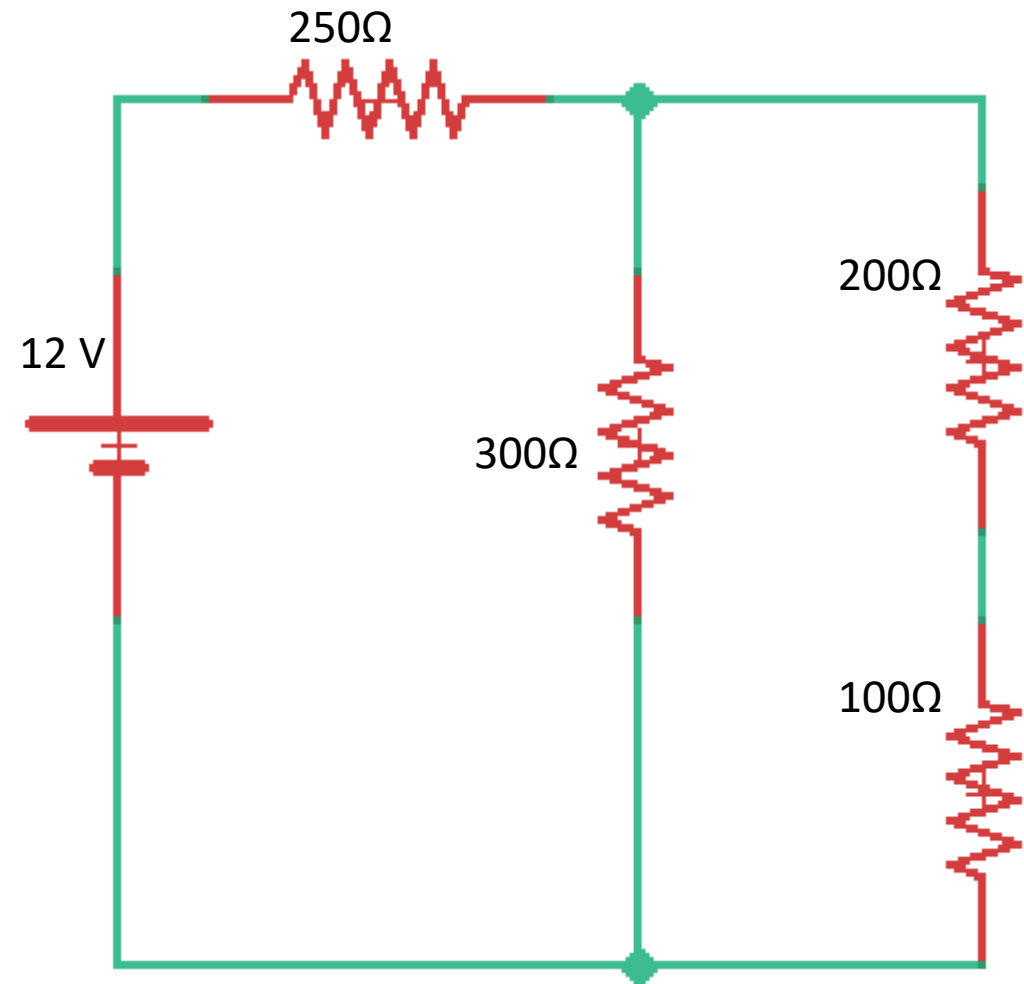


Putting it together



Find the equivalent resistance of this circuit

More!



Find the equivalent resistance of this circuit

Closing

- You did it! You graduated High School and are now entering the corporate workforce doing what you do best: being a resistor. You (a resistor) wish to join a circuit with a good culture/benefits/dental-plan/etc., but are undecided on whether to join a circuit in parallel or in series. From a safety standpoint, do you think you should join a circuit in series or in parallel and why?