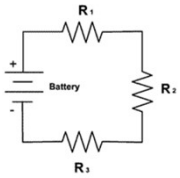
OHM'S LAW PROBLEMS

- An electric heater works by passing a current of 100 A though a coiled metal wire, making it red hot. If the resistance of the wire is 1.1 ohms, what voltage must be applied to it?

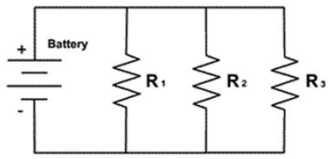
ANALYSIS OF SERIES AND PARALLEL CIRCUITS

SERIES AND PARALLEL

- Series circuit (only one path)

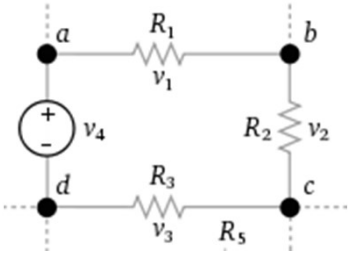


- Parallel circuit (multiple paths)



KIRCHHOFF'S VOLTAGE LAW

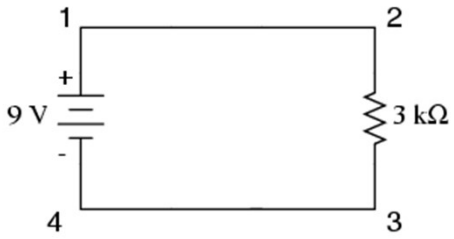
- The sum of the electrical voltage around any closed network is zero



- $V_1+V_2+V_3+V_4=0$

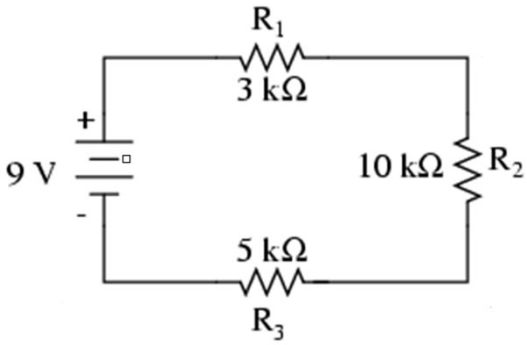
SIMPLE SERIES CIRCUIT

- Ohm's law allows us to calculate any variable assuming we know the other two.



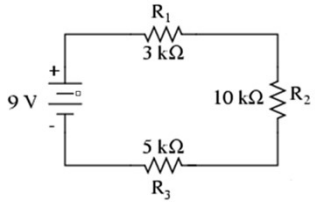
SIMPLE SERIES CIRCUIT

- What about circuits like this?



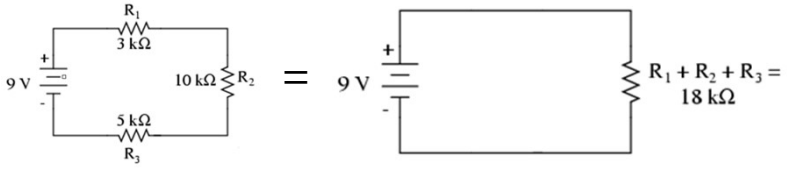
SIMPLE SERIES CIRCUIT

- What about circuits like this?
  - Know the total voltage drop
  - Know individual resistance values
  - Current is the same through all resistors but is unknown
  - TOO MANY UNKNOWNS TO SOLVE
- Need to calculate the EQUIVALENT resistance for the entire circuit



EQUIVALENT RESISTANCE FOR SERIES CIRCUITS

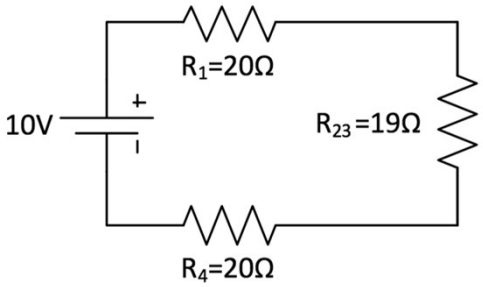
- In a series circuit the EQUIVALENT resistance is equal to the SUM of all resistors
  - 3kΩ + 10kΩ + 5kΩ = 18kΩ



- We can now calculate the current and voltages across each resistor

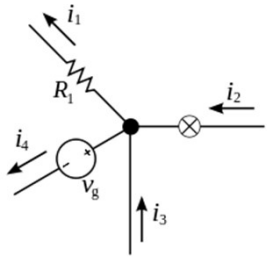
PRACTICE

- Solve the circuit:



KIRCHHOFF'S CURRENT LAW

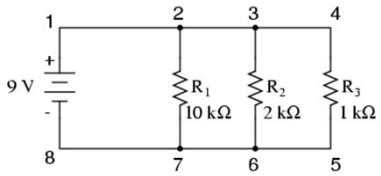
- the sum of currents flowing into that node is equal to the sum of currents flowing out of that node



- $i_1+i_4=i_2+i_3$

SIMPLE PARALLEL CIRCUIT

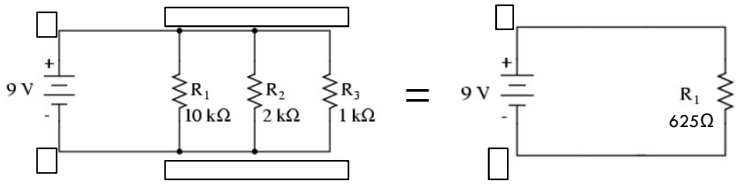
- Consider:



- We know:
  - Individual resistance values
  - Voltage drop across each resistor
  - Current through all resistors must add to total current from the source
- Solve the circuit

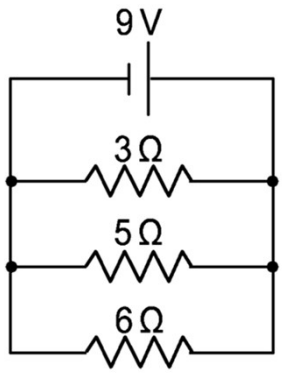
EQUIVALENT RESISTANCE FOR PARALLEL CIRCUITS

- In a parallel circuit the EQUIVALENT resistance is calculated by $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_1} + \frac{1}{R_3}$



PRACTICE

- Solve the circuit



COMBINATION CIRCUITS

- What about this?