F: Electric Potential Diagrams 1 Name _____

Goal of this section:
Represent a circuit with a graph of electric potential.

Electric Potential Graphs

A *electrical potential graph* is a type of diagram that illustrates how voltage, current, and resistance work.
I also like to call them "mountain trail diagrams", although that certainly isn't the correct technical term. This is because I like to think of them as trails over a mountain.

Electric Potential

Electric potential is the amount of potential energy a unit charge has a particular point.

Potential Difference

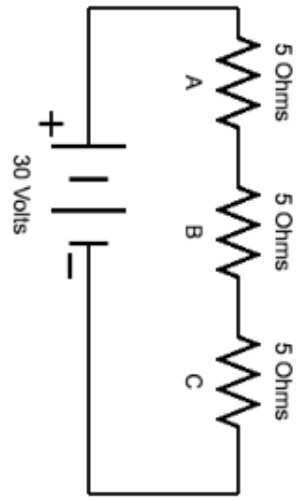
Potential Difference is a more mathematical term for *voltage*.

It represents the amount of potential energy that is lost or gained by a unit charge as it passes a particular circuit element (such as a battery or a resistor).

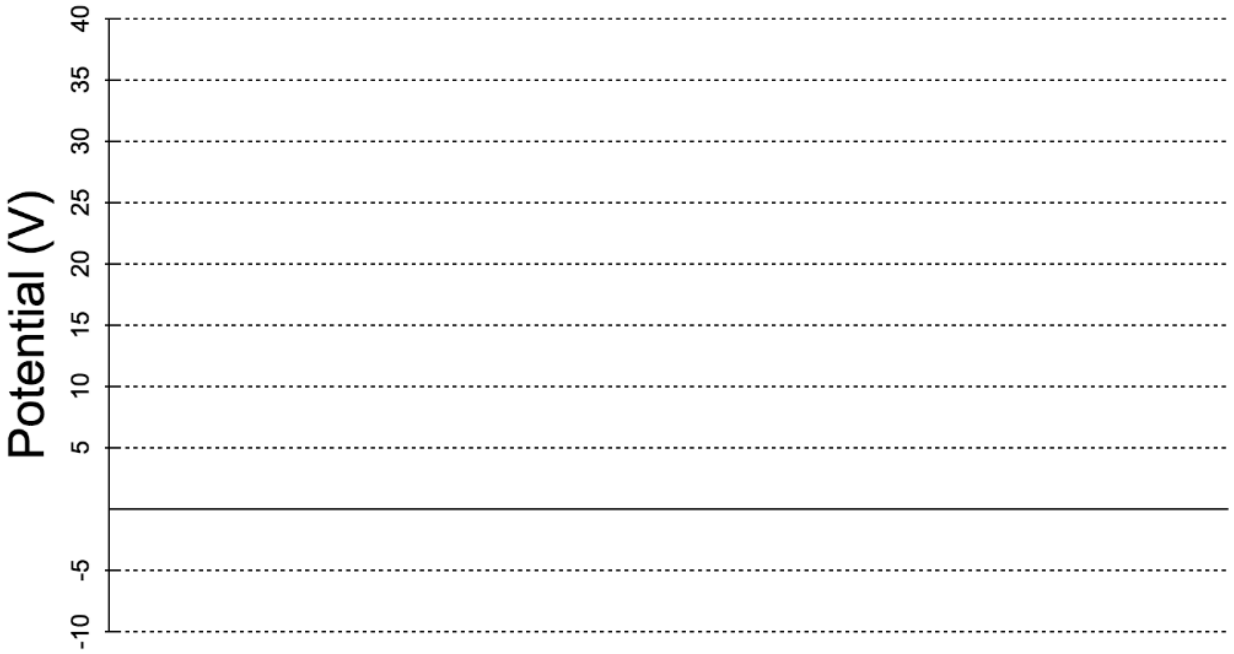
Part 1: How to Draw an Electric Potential Graph for a Simple Series Circuit:

1. Solve for the voltage, current, and resistance of each circuit element. This time, however, voltage is called *potential difference*. Also, instead of a column that says "total," there is a column that says "battery."
2. Make the potential difference negative for each resistor. Now, instead of adding up to the total, each resistor and the battery will add to zero.
2. "Electric Potential" in volts is the label on the Y-axis. The X-axis is unlabeled, but roughly represents the position within a circuit.
(These graphs are more conceptual than rigorously mathematical.)
3. Start with a potential of 0. The battery is represented by an upward sloped line of the correct potential difference.
4. After the battery, draw a short horizontal line segment. Each resistor is represented by a downward sloped line of the correct potential difference, and followed by a horizontal line segment.
5. Upon reaching the bottom, draw a horizontal line back to your starting point, indicating the circuit is circular.
6. Label each upward or downward sloped segment as the battery or as a resistor.

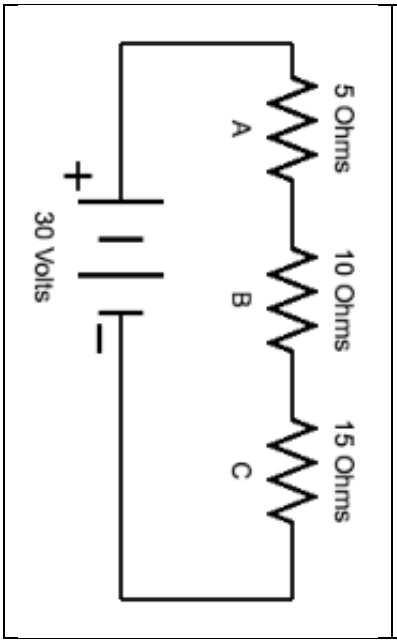
Problem F.1: A 30 Volt battery is connected to three 5 Ohm resistors in series. Solve all elements of the circuit and draw a diagram of the electric potential within the circuit.



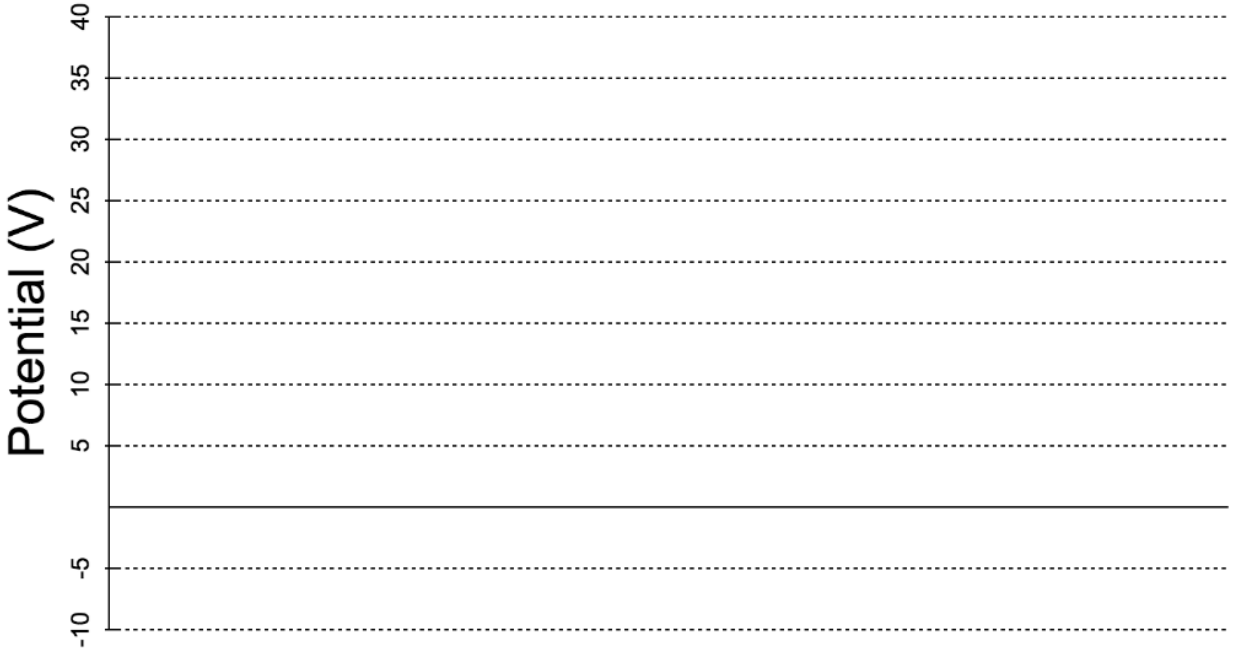
	A	B	C	Total (battery)
Potential Difference (V)				
Current (I)				
Resistance (R)				



Problem F.2: A 30 volt battery is connected to a 5 Ohm, 10 Ohm, and 15 Ohm resistor in series. Solve for all elements of the circuit and draw a diagram of the electric potential within the circuit.



	A	B	C	Total (battery)
Potential Difference (V)				
Current (I)				
Resistance (R)				



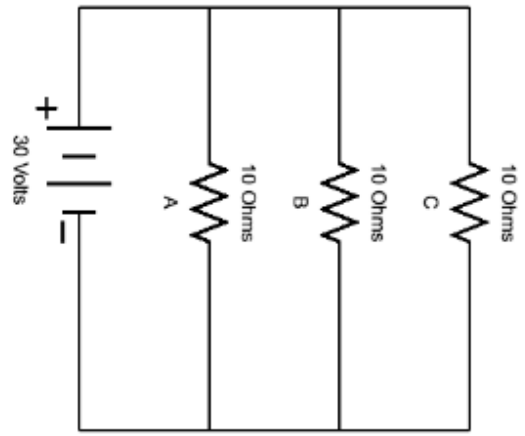
Part 2: Drawing an Electric Potential graph for a Simple Parallel Circuit:

1. Solve for the voltage, current, and resistance of each circuit element. This time, however, voltage is called *potential difference*. Also, instead of a column that says "total," there is a column that says "battery."
2. Make the potential difference of each resistor negative. Now, instead of adding up to the total, each resistor and the battery will add to zero.
3. "Electric Potential" in volts is the label on the Y-axis. The X-axis is unlabeled, but roughly represents the position within a circuit.
(These graphs are more conceptual than rigorously mathematical.)
4. Start with a potential of 0. The battery is represented by an upward sloped line of the correct potential difference.
5. After the battery, draw a short horizontal line segment. Each resistor is represented by a downward sloped line to the bottom of the graph. (Because, in a parallel circuit, the voltage drop of each resistor is equal to the voltage of the battery.) Between the downward sloped lines representing the resistors, draw a horizontal line segment.
6. Upon reaching the bottom of each drop, draw a horizontal line back to your starting point indicating the circuit is circular.
7. Label each upward or downward sloped segment as the battery or as a resistor.

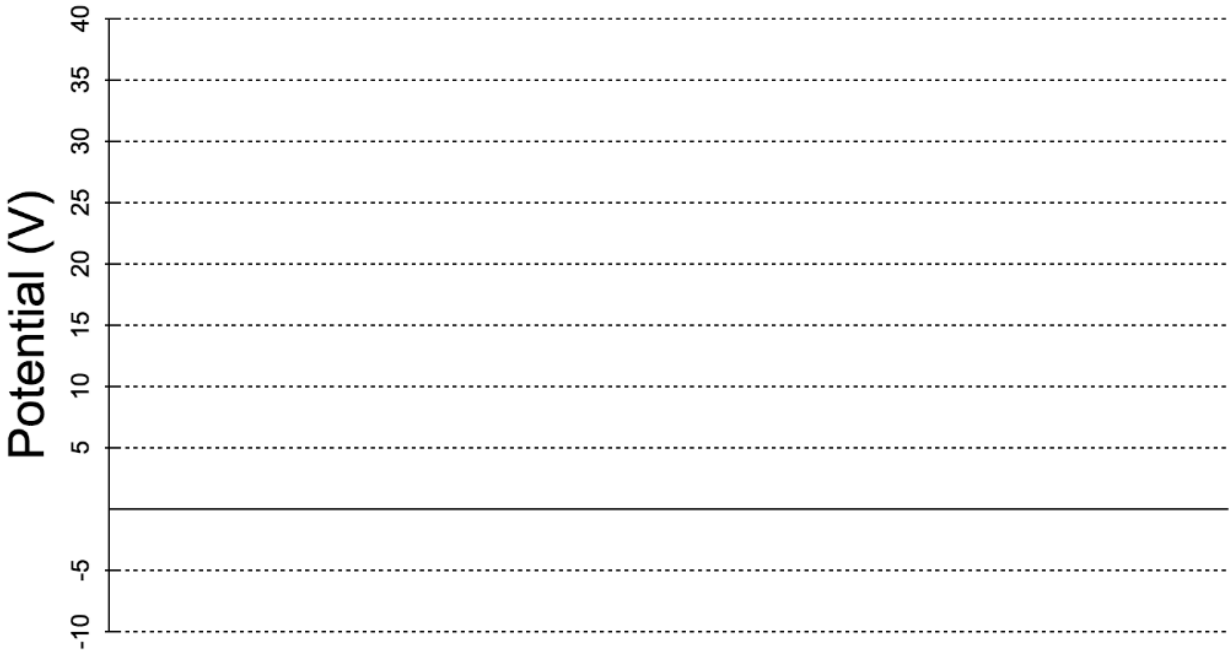
NEW STEP!!!!

8. For each line segment within your graph, indicate the *current* within that line segment.

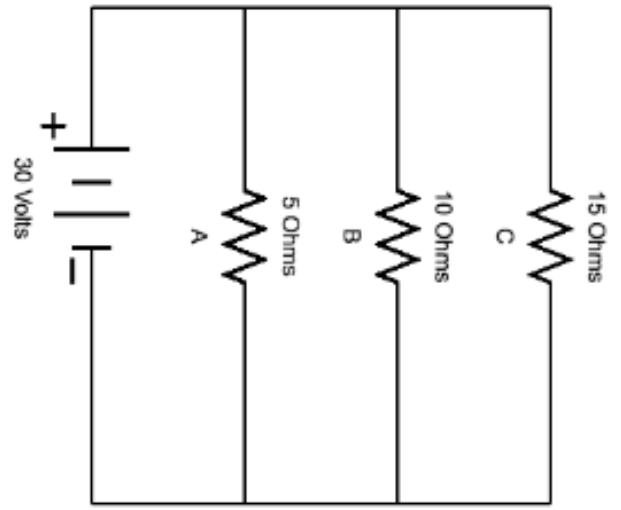
Problem F.3. A 30 Volt battery is connected to three 10 Ohm resistors in parallel. Solve for the potential difference, current and voltage of each element, and draw an electric potential diagram. For each segment of the electric potential diagram, indicate the current within that segment.



	A	B	C	Total (battery)
Potential Difference (V)				
Current (I)				
Resistance (R)				



Problem F.4: A 30 Volt battery is connected to a 5 Ohm resistor, a 10 Ohm resistor, and a 15 Ohm resistor in parallel. Solve for the potential difference, current and voltage of each element, and draw an electric potential diagram. For each segment of the electric potential diagram, indicate the current within that segment.



	A	B	C	Total (battery)
Potential Difference (V)				
Current (I)				
Resistance (R)