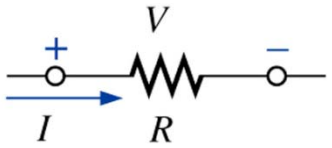
Ohm's Law

- Defines the relationship between voltage, current and resistance in a electric circuit.
- Discovered by Georg Simon Ohm in 1827
- Ohm's Law states:

  That current in a resistor varies in direct proportion to the voltage applied to it and is inversely proportional to the resistor's value.

- Stated Mathematically: $$I = \frac{V}{R}$$



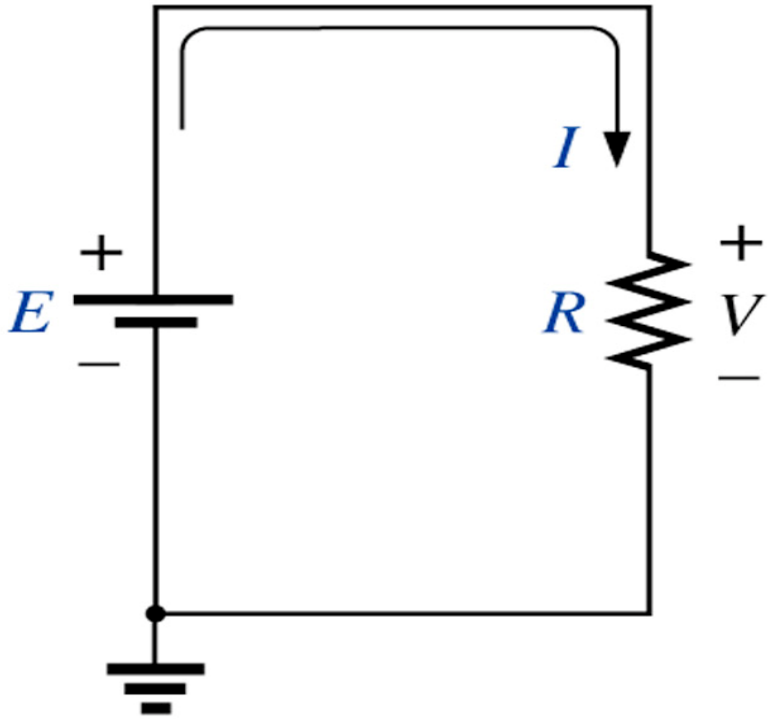
Where : I is the current; in Amperes

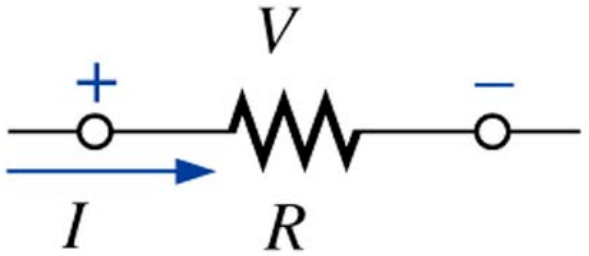
V is the potential difference; in Volts

R is the resistance; in Ohms

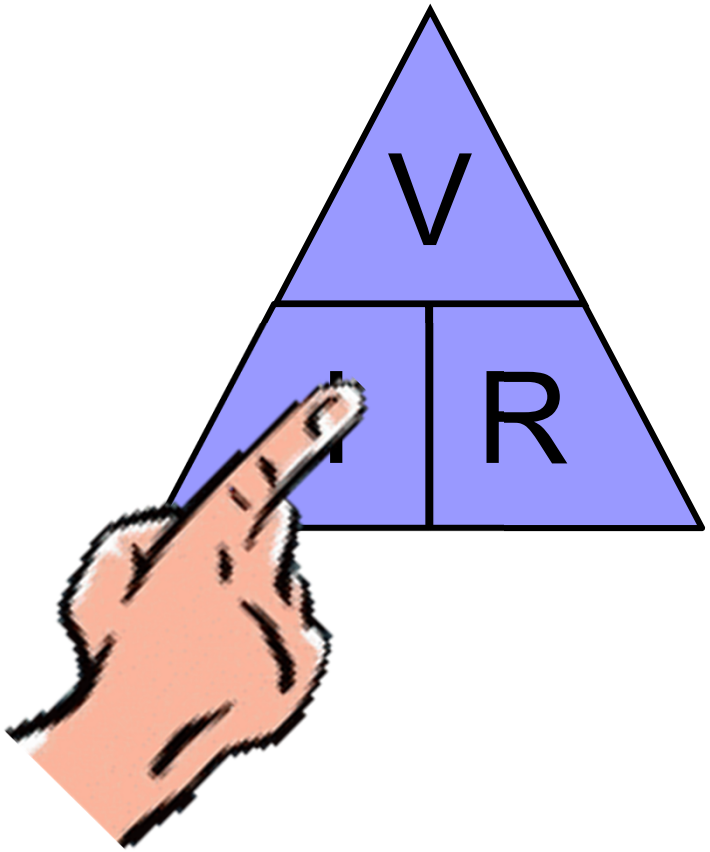
Voltage Sources & Voltage Drops

- The potential difference is sometimes designated by *E* instead of *V*.
- The symbol E applies to voltage sources.
- The symbol V applies to voltage drops across resistors.
- Both (E & V) are used interchangeably in the Ohm's Law equations





Ohm's Law Triangle



$$I = \frac{V}{R} \quad (\text{amperes}, A)$$

$$R = \frac{V}{I} \quad (\text{ohms}, \Omega)$$

$$V = IR \quad (\text{volts}, V)$$

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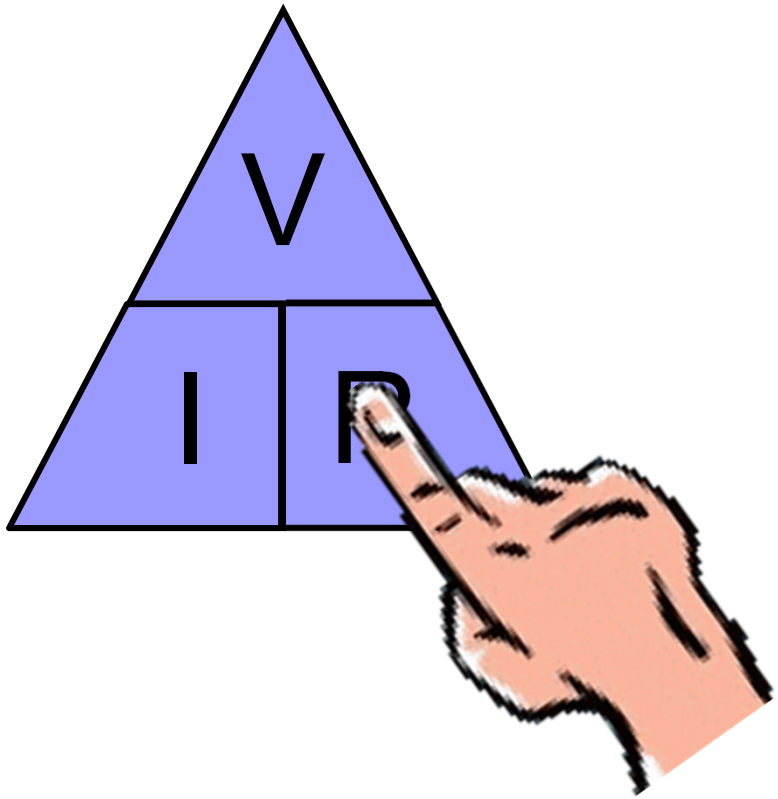

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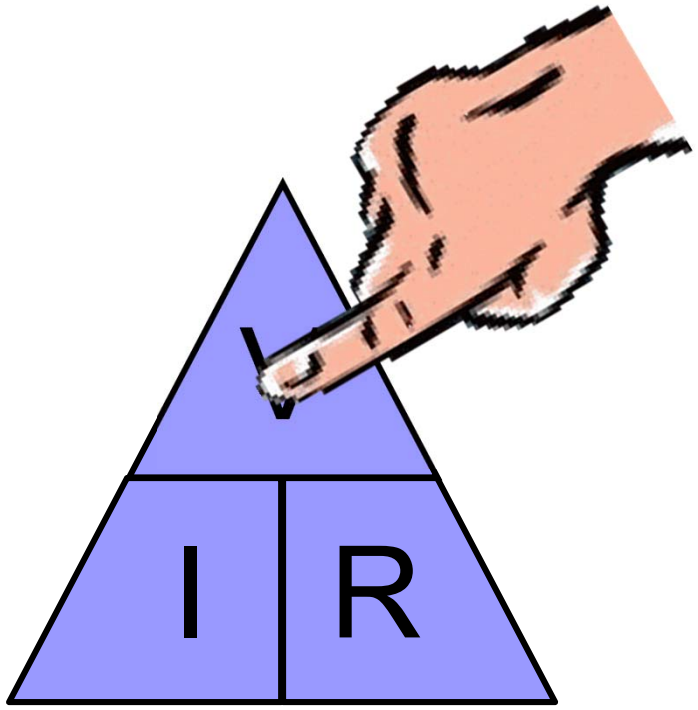

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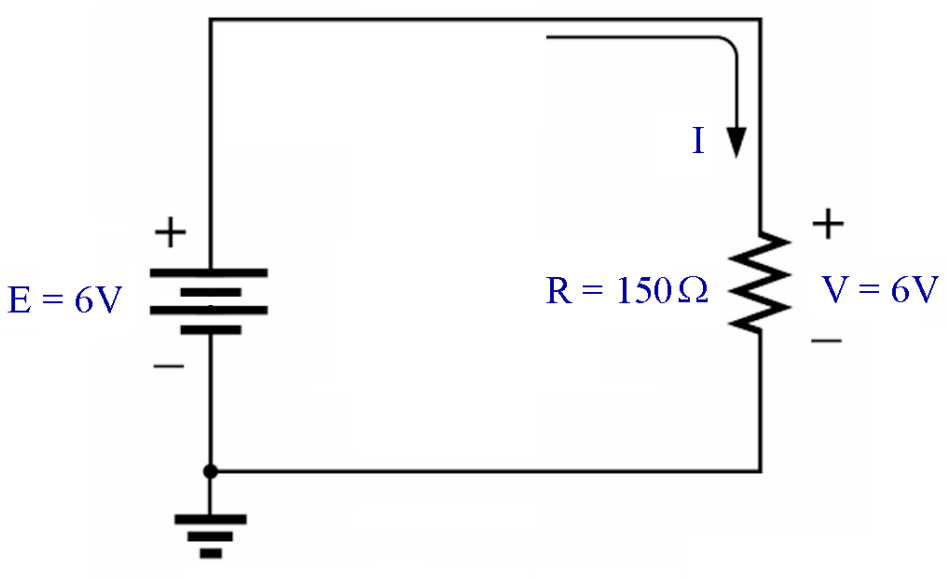
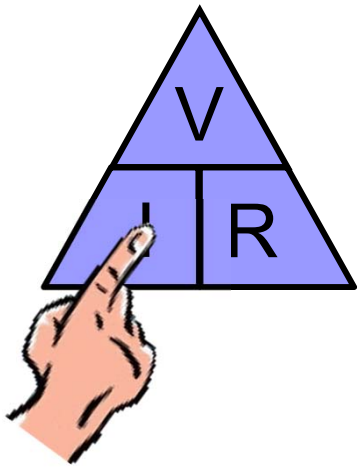
Example – Ohm's Law

The flashlight shown uses a 6 volt battery and has a bulb with a resistance of 150 Ω. When on, how much current will be drawn from the battery?

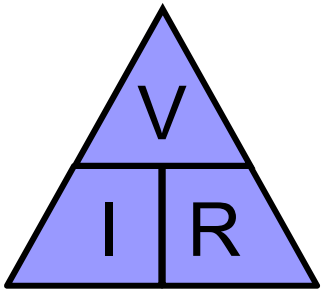


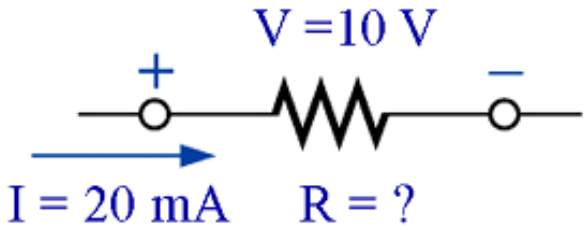


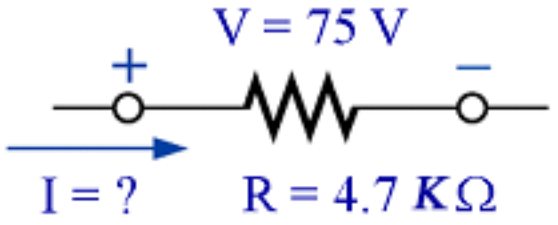
$$I = \frac{V}{R} = \frac{6\,V}{150\,\Omega} = 0.04\ \text{A} = 40\ \text{mA}$$

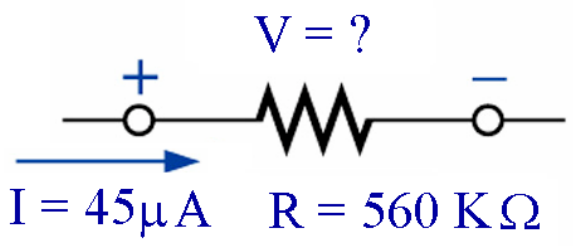
Breakout Exercise #1

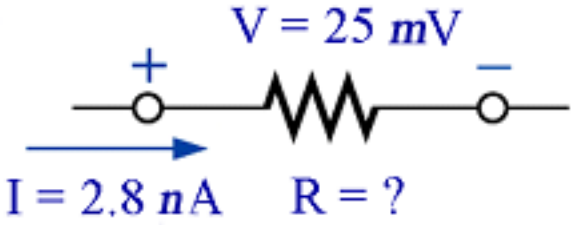
For each of the Ohm's law problems shown, find the unknown.



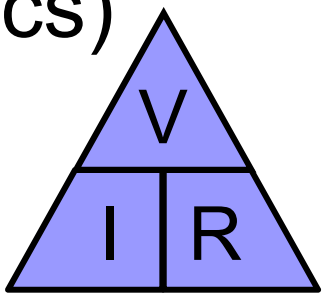


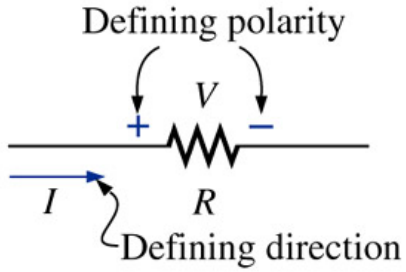


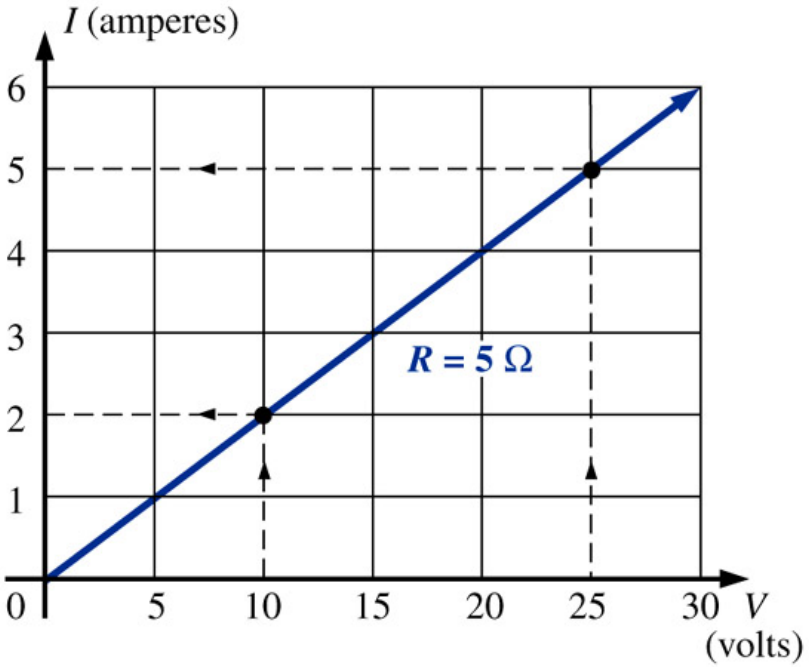




Plotting Ohm's Law (I-V Characteristics)







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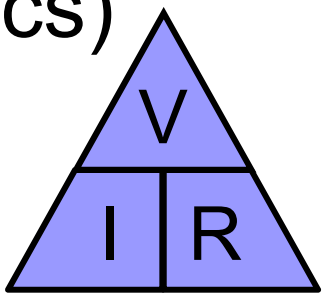

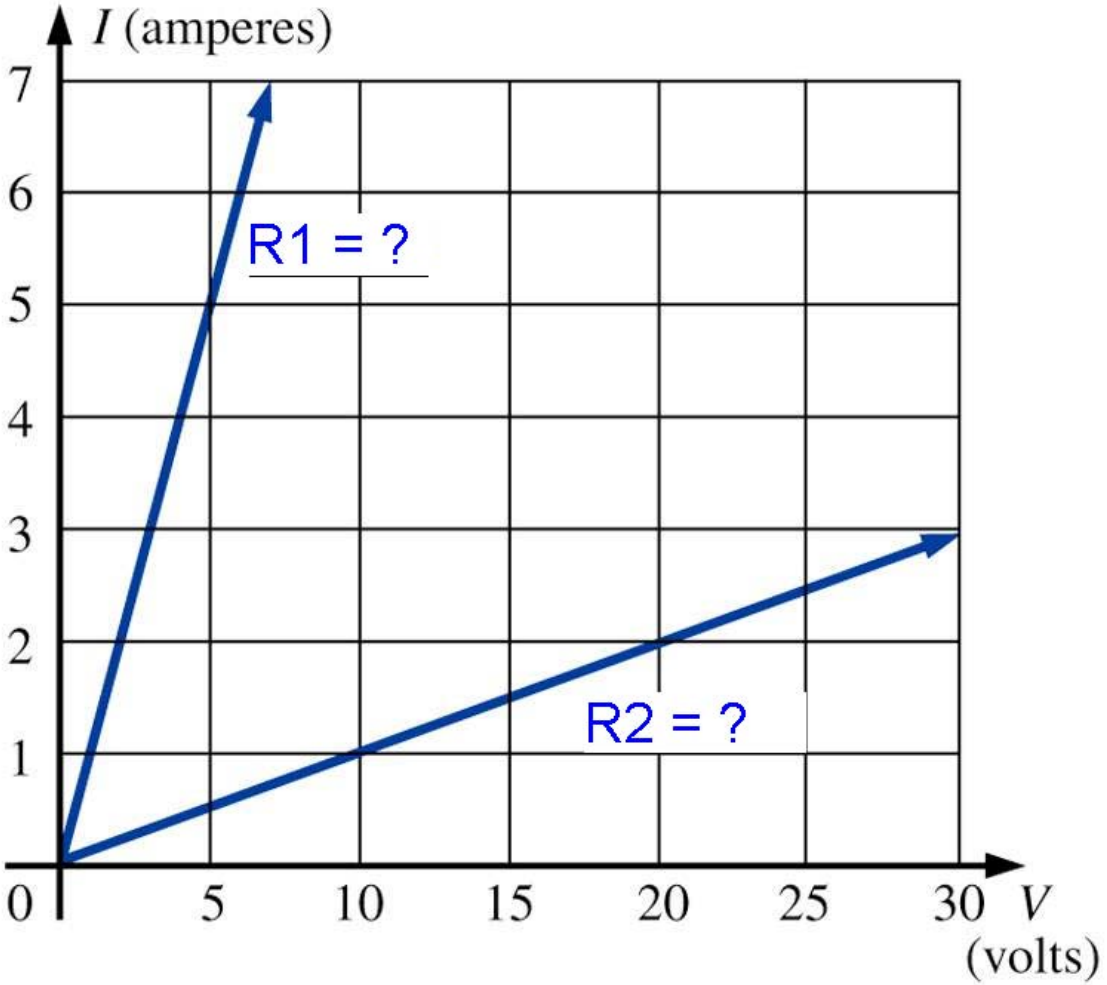

Breakout Exercise #2

- Estimate the resistance of the diode at V_D = 1.6V and V_D = 1.7V, using the I-V characteristics shown.
- Bonus: What type of diode is this?