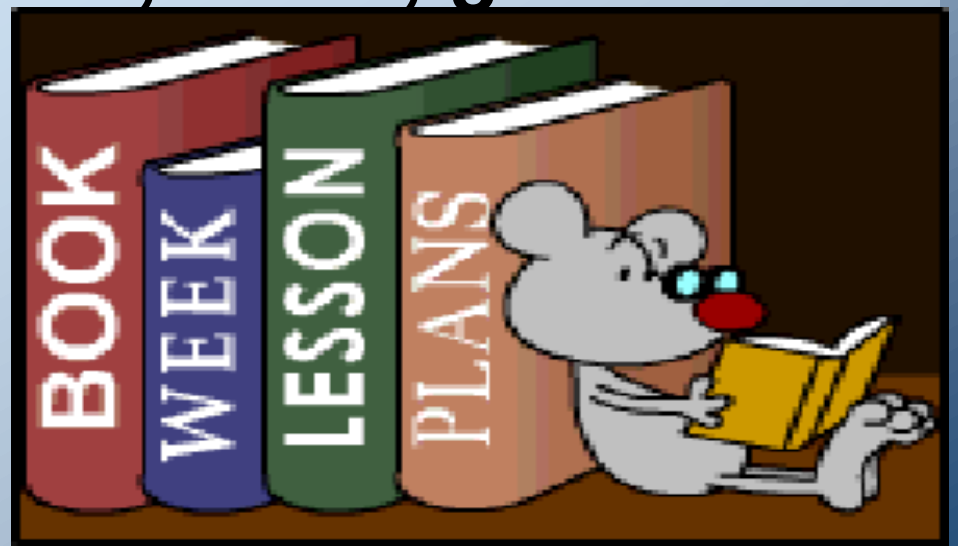
PROGRAMME: ICP
CENTRE: Point Fortin
COURSE: ELECTRICAL INSTALLATION
LEVEL # 1
INSTRUCTOR: MASLYN VERNE MENDEZ

Perform related computations, Ohm's Law

RECAPPING LAST DAY LESSON

WHAT IS A CONDUCTORS

A conductor is a material having a low resistance which allows electric current to flow in it. All metals are conductors and some examples include copper, aluminium, brass, platinum, silver, gold and carbon.



WHAT IS AN INSULATORS

An insulator is a material having a high resistance which does not allow electric current to flow in it. Some examples of insulators include plastic, rubber, glass, porcelain, air, paper, cork, mica, ceramics and certain oils.

LESSON ICE BREAKER

ww.youtube.com/watch?v=BPFX3https://wK7Wb1I

https://www.youtube.com/watch?v=oFTj9LWkmm8

TODAYS LESSON OBJECTIVES

General Objectives:

At the end of this lesson the students will gain a knowledge and an understanding of Ohm's Law.

SPECIFIC OBJECTIVE:

At the end of this lesson the students will be able to:

- ✓ Establish the history of Ohm's law.
- ✓ Explain that a potential difference (p.d.) between two points in a circuit is required for current to flow
- ✓ Recognize that resistance opposes current flow and is measured in ohms
- ✓ Use Ohm's law in calculations, including multiples and sub-multiples of units

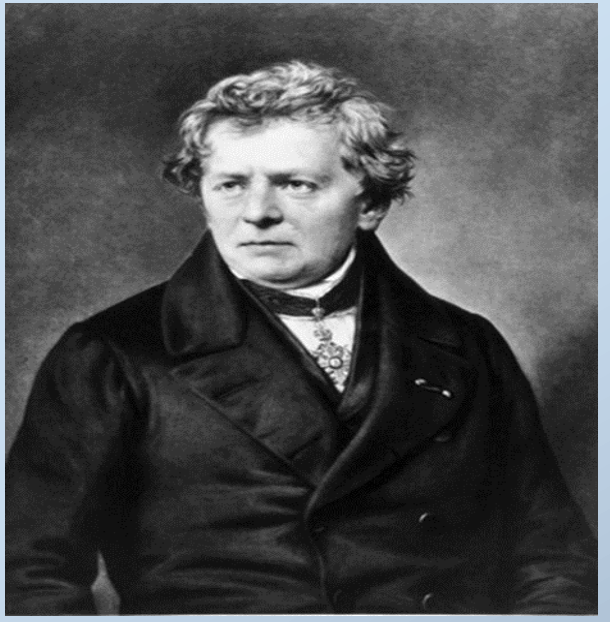
SPECIFIC OBJECTIVE CONTINUED

- ✓State Ohm's law as V =IR or I = $\frac{V}{R}$ or $R = \frac{V}{I}$
- ✓ Calculate voltage, current and resistance in a circuit using Ohm's law.
- ✓State the unit of current

OHM'S LAW HISTORY

- Discovered in 1825
- Relates 3 key quantities in electrical circuits
- Voltage (V)
- Current (I)
- Resistance (R)
- V = I x R
- Voltage = Current x Resistance

In scientific units: Volts = Amperes x Ohms

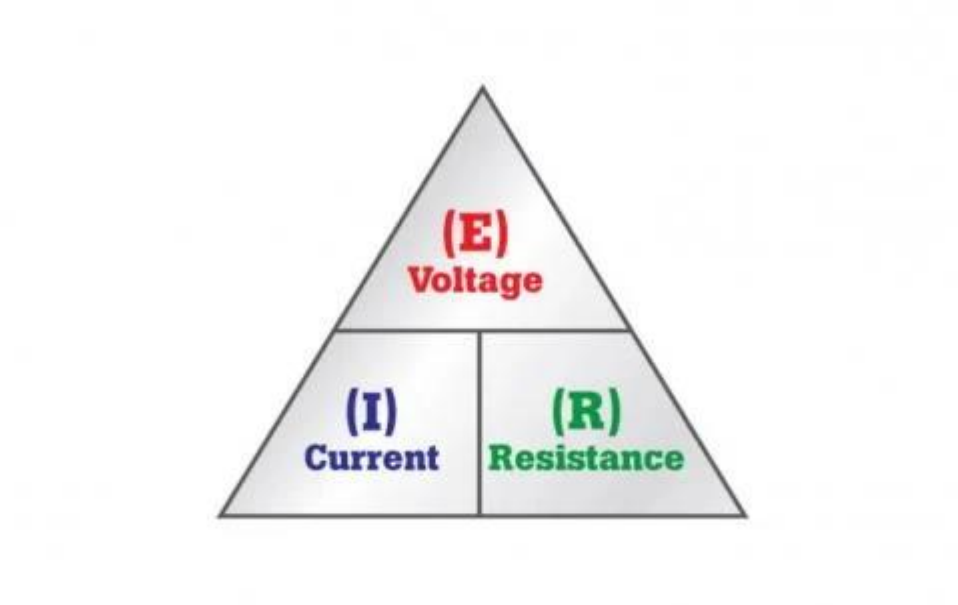


Georg Simon Ohm

Think of the voltage as the FORCE which is DRIVING the total electrical flow rate (current), *against* the resistance encountered in a portion of an electrical circuit (Saslow, 2002,).

WHAT IS OHM'S LAW

- Ohm's Law is a formula used to calculate the relationship between voltage, current and resistance in an electrical circuit (Kipnis, 2009,). The triangles below represents these quantities



OR

THE DEFINITION OF OHM'S LAW

Ohm's law states that the electrical current (I) flowing in a circuit is directly proportional to the voltage (V) and inversely proportional to the resistance (R). Therefore, if the voltage is increased, the current will increase provided the resistance of the circuit does not change (Ohm's law: History and biography, 2021).

Therefore $I = \frac{V}{R}$

OHM'S LAW

defines the relationship between voltage, current and resistance.

These basic electrical units apply to direct current, or alternating current.

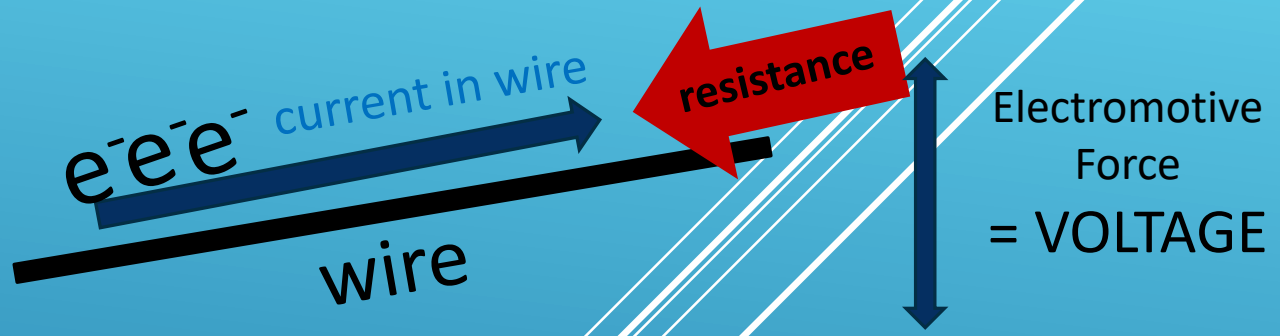
Ohm's Law is the foundation of electronics and electricity.

This formula is used extensively by electricians.
Without a thorough understanding of "Ohm's Law" an electrician *can not* design or troubleshoot even the simplest of electronic or electrical circuits.

Ohm established in the late 1820's that if a voltage was applied to a resistance then "current would flow and then power would be consumed" (Ohm's law: History and biography, 2021).

Voltage = (electrical) Current x (electrical) Resistance

Compare to pushing or cycling a bike up a hill



1) The force is your capacity for work to push or cycle the bike (or to 'drive' it); **that is like the Voltage in a circuit.**

2) The **resistance** is like the friction force on the tyres, the stiffness of the bike components, and the steepness of the hill; **all these factors work together to determine the rate of progress for a given force.**

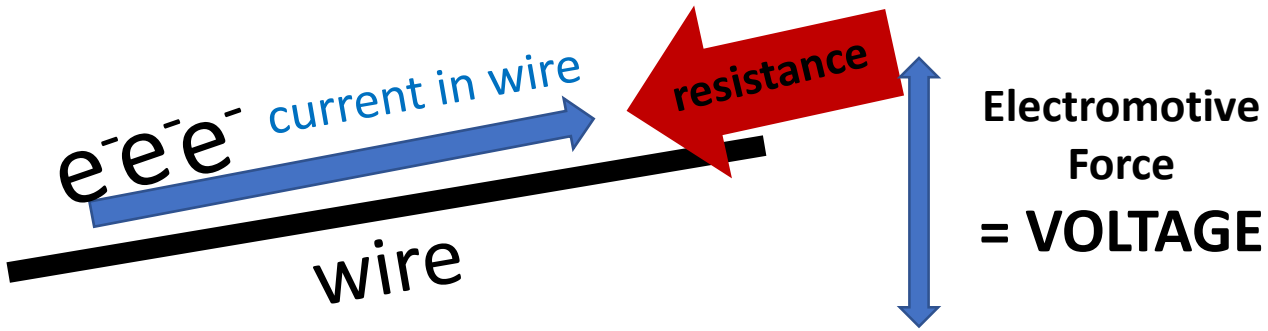
3) **The rate of progress (up the hill) – is similar to the "current" in a circuit**, which measures the total passage of electricity in a given time through a particular point.

Ohm's Law

$$V = I \times R$$

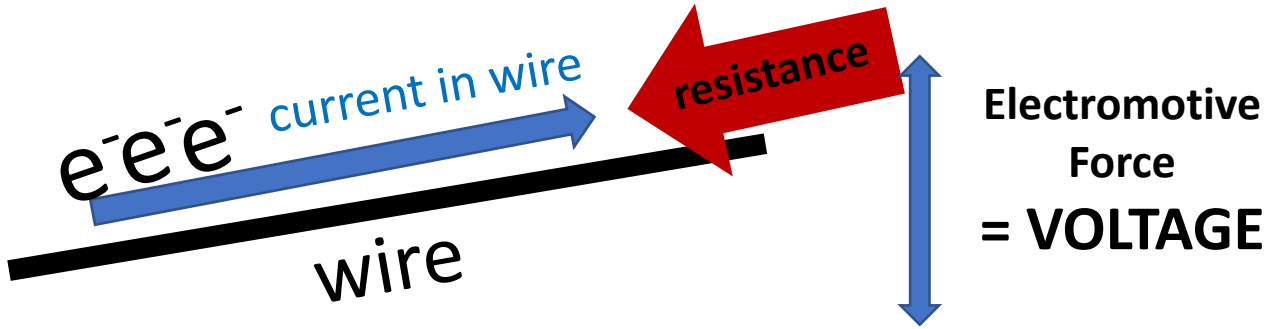
Voltage = Current x Resistance

e^- = an electron, the basic physical unit of a current. (billions of billions pass through a mains circuit every second).

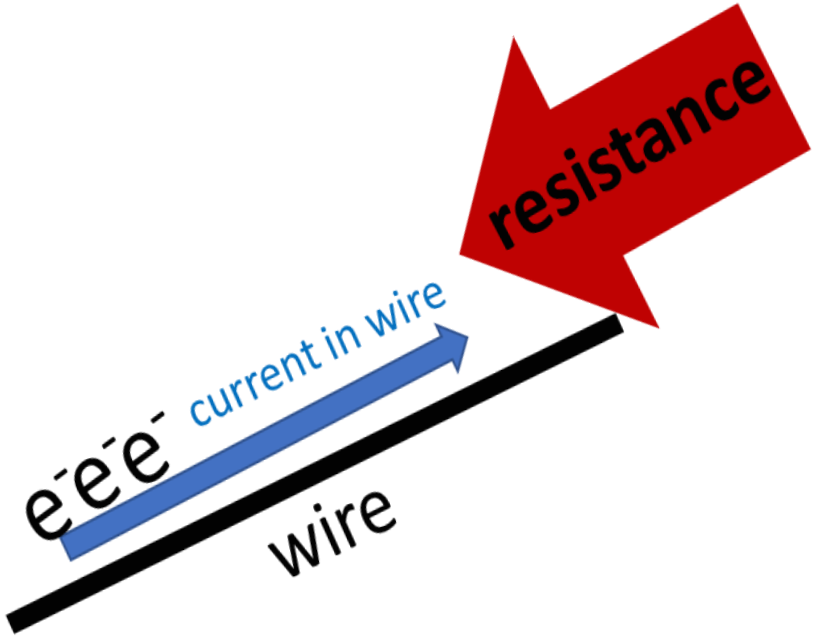


The wire is not *really* on a slope, like the example of the bike up the hill.
It is not ***gravity*** creating the resistance to the work done:
it is the **material** of the wire itself!
Some materials – such as metals and water- are 'electrical conductors' which offer relatively little resistance to electrons passage through the material.

Suppose a wire has twice the resistance



Doubling the resistance of the circuit wire will mean twice the electromotive force (voltage) required to drive the same current through the circuit.



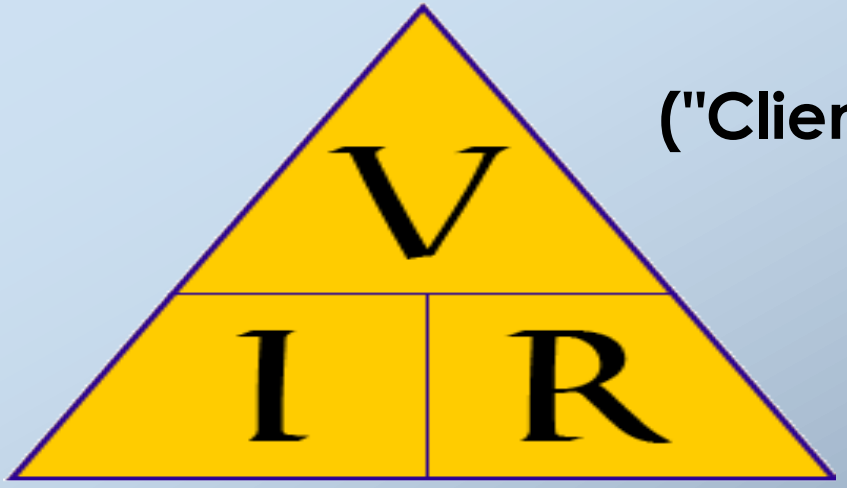
The greater the electrical resistance, the greater the applied voltage V needs to be
to drive the same current I

Voltage is measured in *volts*, symbolized by the letters "E" or "V".

Current measured in *amps*, symbolized by the letter "I".

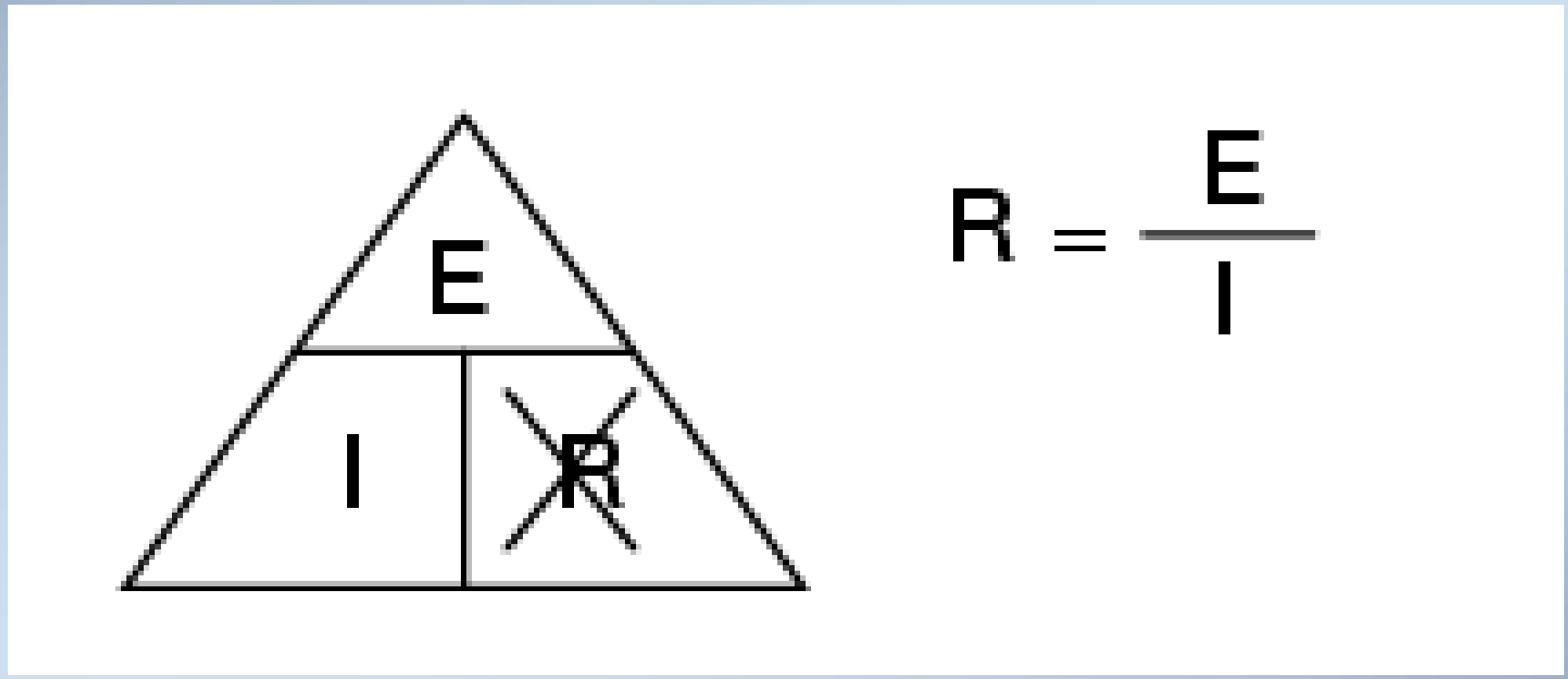
Resistance is measured in *ohms*, symbolized by the letter "R“(Thony DOT christie AT t-online DOT de, 2015).

Quantity	Symbol	Unit of Measurement	Unit Abbreviation
Current	I	Ampere ("Amp")	A
Voltage	E *or* V	Volt	V
Resistance	R	Ohm	Ω

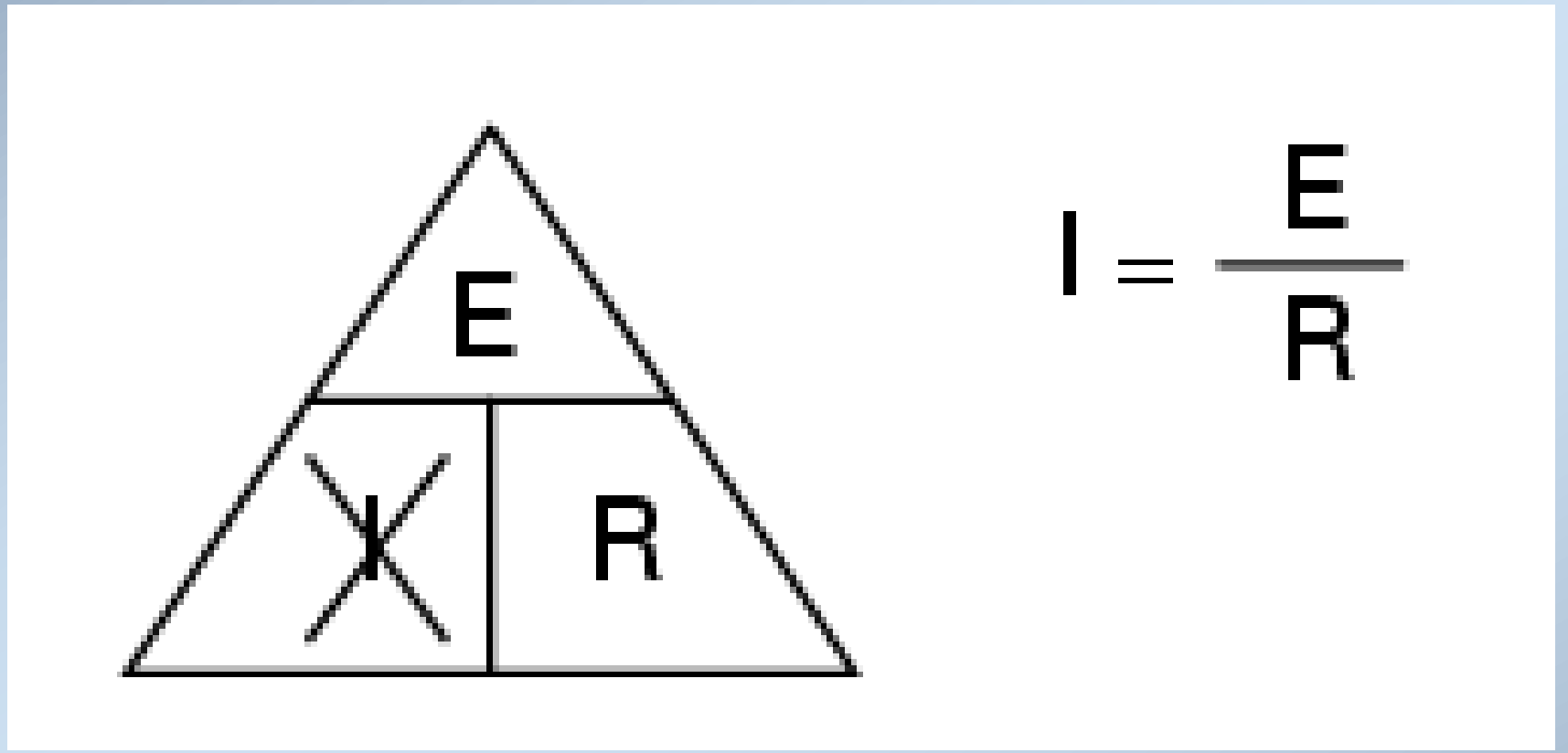


("Client challenge," n.d.)

If you know E and I, and wish to determine R, just eliminate R from the picture and see what's left:

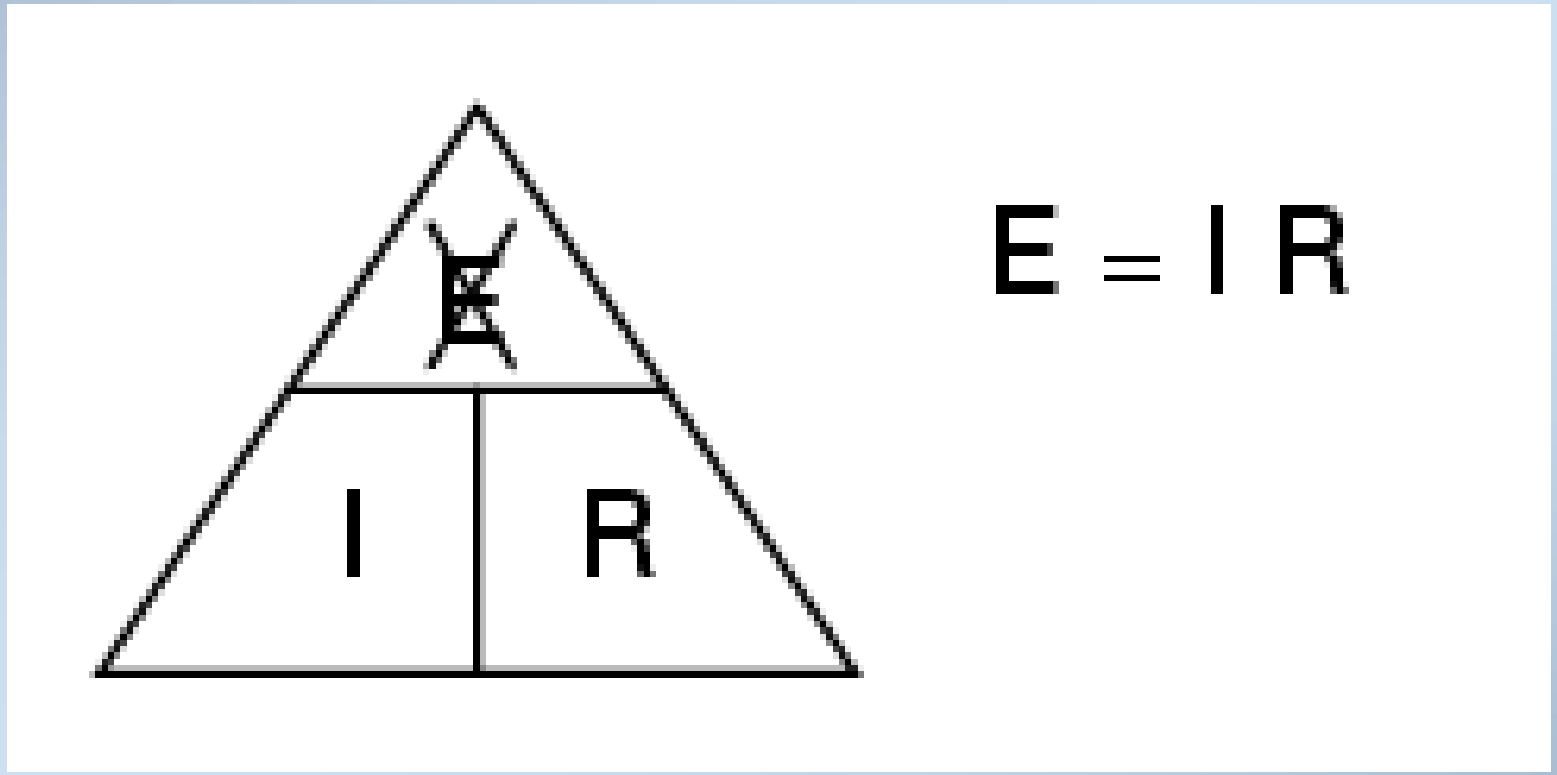


If you know E and R, and wish to determine I, eliminate I and see what's left:

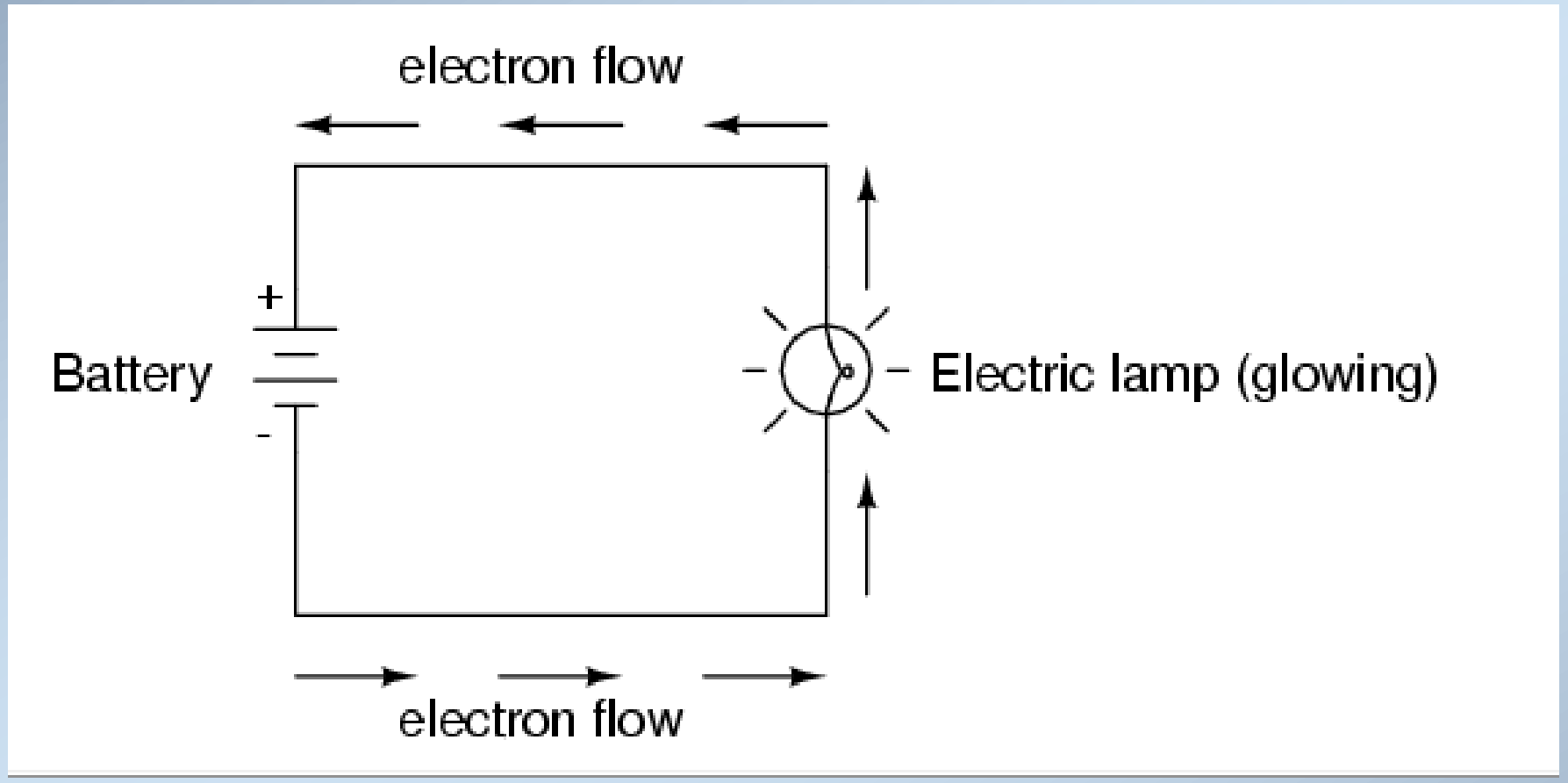


$$I = \frac{E}{R}$$

if you know I and R, and wish to determine E, eliminate E and see what's left:

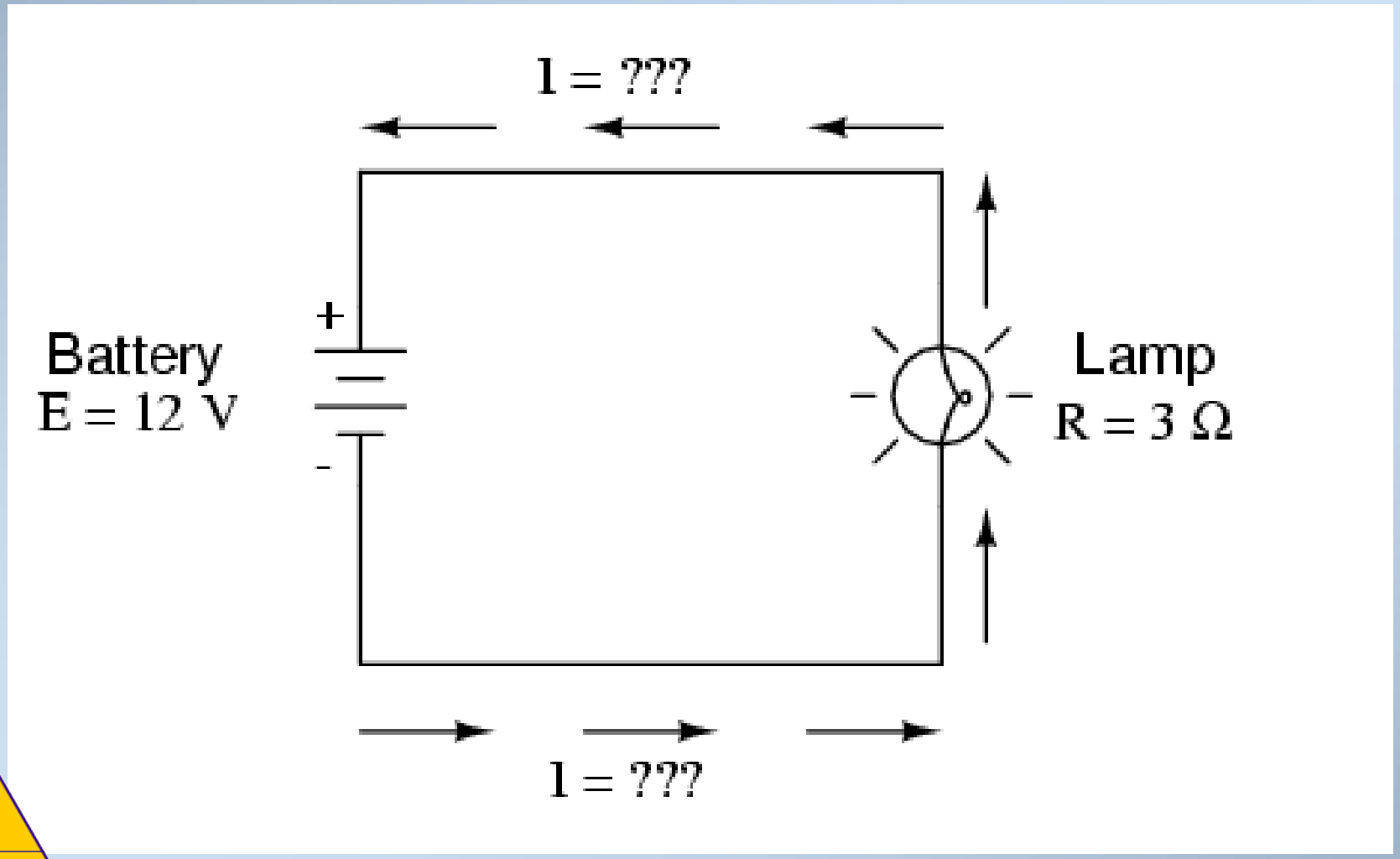


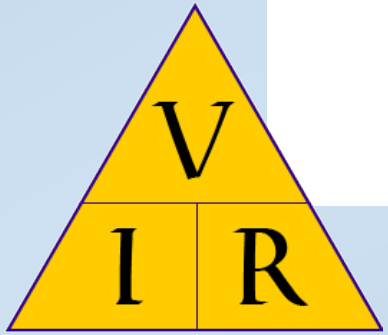
Let's see how these equations might work to help us analyze simple circuits:



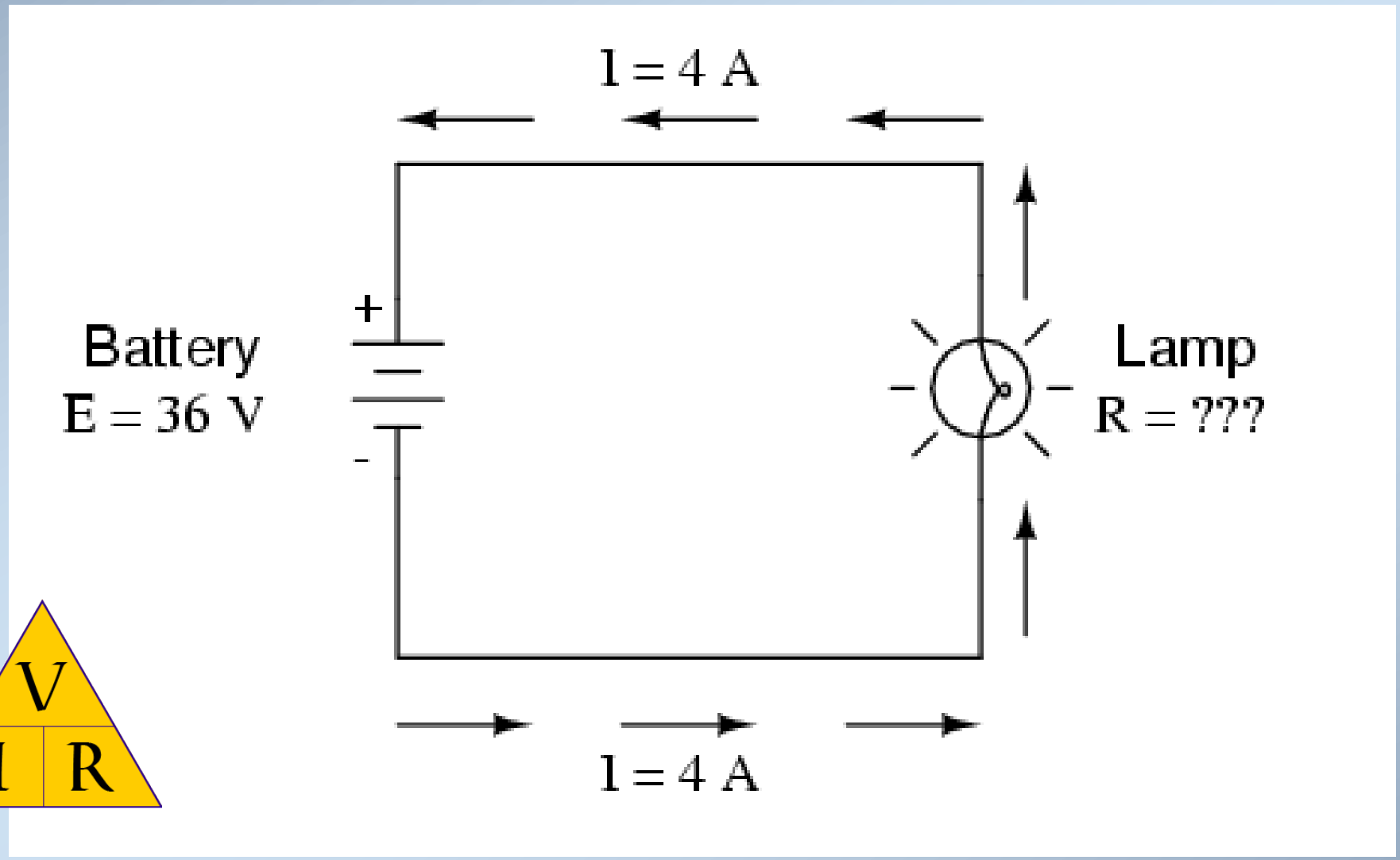
If we know the values of any two of the three quantities (voltage, current, and resistance) in this circuit, we can use Ohm's Law to determine the third.

calculate the amount of current (I) in a circuit, given values of voltage (E) and resistance (R):

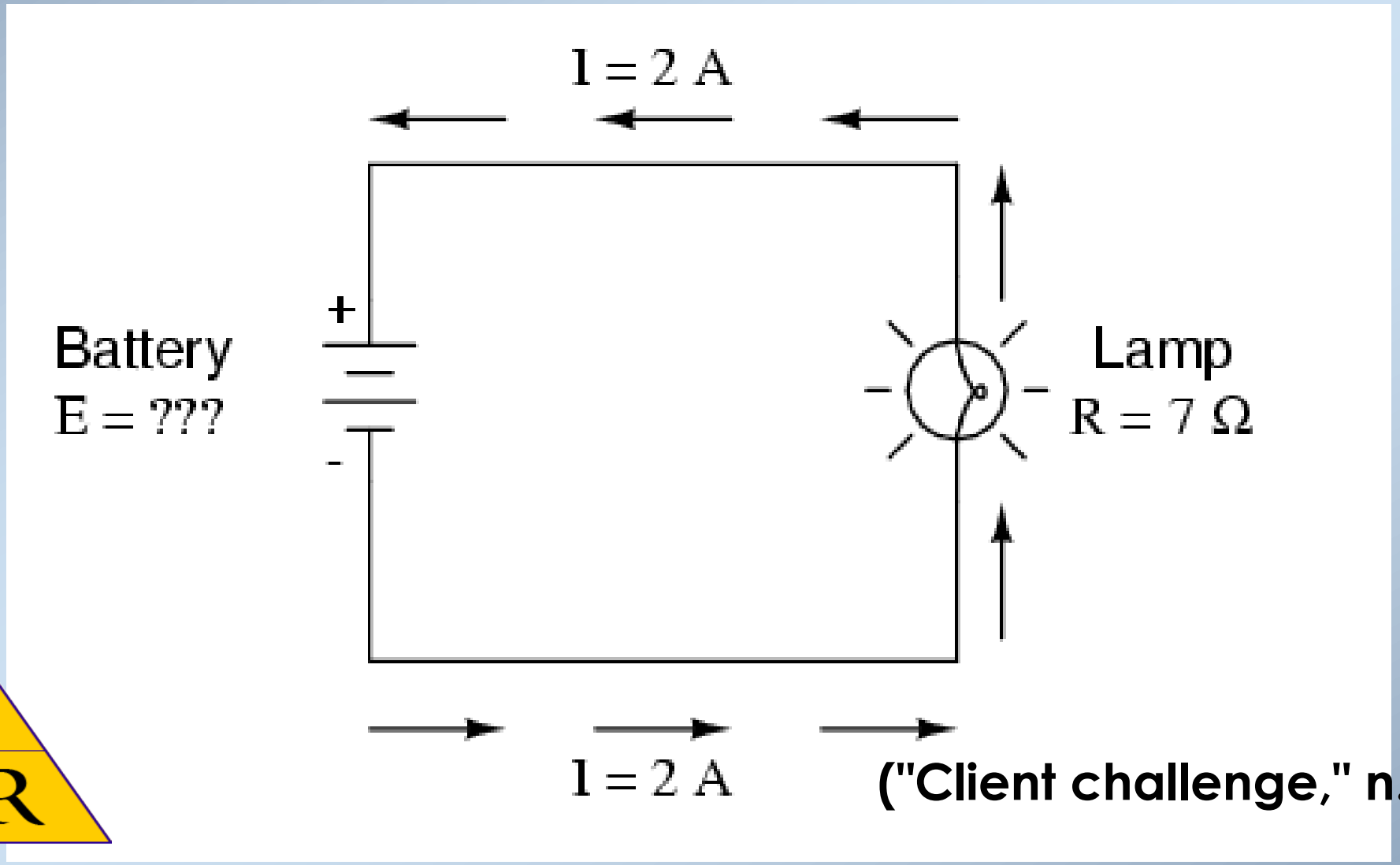


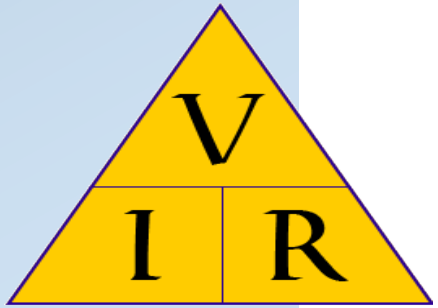


calculate the amount of resistance (R) in a circuit, given values of voltage (E) and current (I):



calculate the amount of voltage supplied by a battery, given values of current (I) and resistance (R):

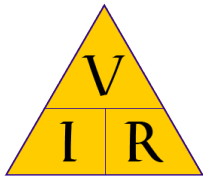




("Client challenge," n.d.)

Ohm's Law

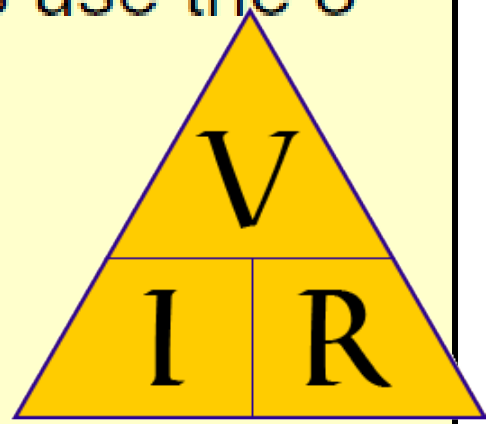
	Resistance	Current	Voltage
Definition	The opposition to the flow of charges	The flow of electrons through a circuit	Potential Difference (the push behind electricity)
Symbol	R	I	V
Equation	$R = \frac{V}{I}$	$I = \frac{V}{R}$	$V = I R$

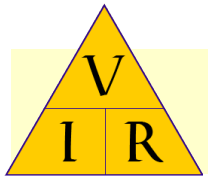


	Resistance	Current	Voltage
Label	Ω - Omega symbol	A - amperes	V - volts
Depends on	**The size of the wire.** Thick wire – Less resistance Thin wire – More resistance Long wire – more resistance Short wire- less resistance	The resistance in the circuit Greater resistance- less current Less resistance the greater the current	The voltage source Greater Potential difference = greater voltage

To obey Ohm's law means a conductor has a constant resistance regardless of the voltage.

- If you know two of the three variables you should be able to solve for the third.
- When using Ohm's law always use the 3 step form
  - 1. Write the equation
  - 2. Replace the known values
  - 3. Solve the problem
  - . Label with the correct unit of measurement.



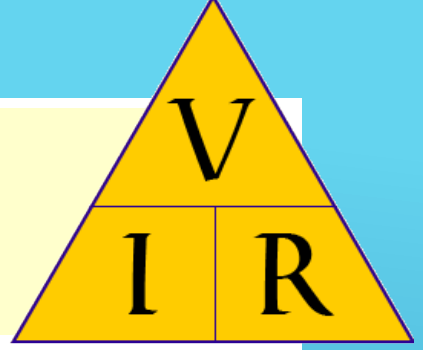


Practice problems

In a circuit, 0.5 A is flowing through the bulb. The voltage across the bulb is 4.0 V. What is the bulbs resistance?

1. Write the equation → $R = \frac{V}{I}$
2. Replace the known values → $R = \frac{4.0}{0.5}$
3. Solve → $R = 8$
4. Label → $R = 8\ \Omega$

Practice problem

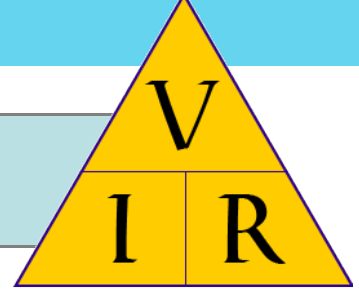


- You light a light bulb with a 1.5 volt battery. If the bulb has a resistance of 10 ohms, how much current is flowing?

1. Write the equation → $I = \frac{V}{R}$
2. Replace the known values → $I = \frac{1.5}{10}$
3. Solve → $I = 0.15$

LESSON SUMMARY

Ohm's Law



	Resistance	Current	Voltage
Definition	The opposition to the flow of charges	The flow of electrons through a circuit	**The force or pressure behind electricity**
Symbol	R	I	V
Equation	$R = \frac{V}{I}$	$I = \frac{V}{R}$	$V = I R$

	Resistance	Current	Voltage
Label	Ω - Omega symbol	A - amperes	V - volts
Depends on	**The size of the wire.** Thick wire – Less resistance Thin wire – More resistance Long wire – more resistance Short wire- less resistance	The resistance in the circuit Greater resistance- less current Less resistance the greater the current	The voltage source Potential difference

ADDITIONAL INFORMATION ON THE TOPIC PLEASE CLICK ON THE LINK PROVIDED.

https://www.youtube.com/watch?v=iLzfe_HxrWI

https://www.youtube.com/watch?v=_rSHqvjDksg&t=3s

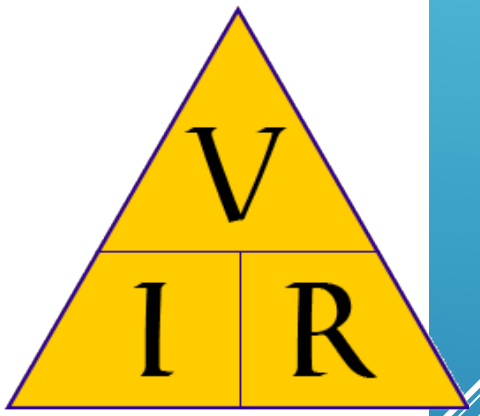
ASSIGNMENT

Practice problems

1

In a circuit, 0.5 A is flowing through the bulb. The voltage across the bulb is 4.0 V. What is the bulbs resistance?

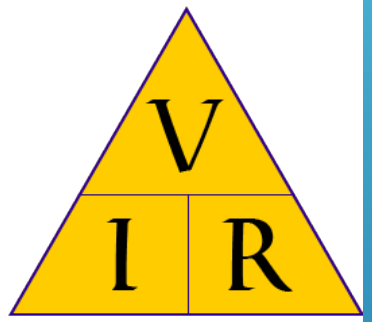
1. Write the equation →
2. Replace the known values →
3. Solve →
4. Label →



Practice problem 2

- You light a light bulb with a 1.5 volt battery. If the bulb has a resistance of 10 ohms, how much current is flowing?

1. Write the equation →
2. Replace the known values →
3. Solve →
4. Label →



ASSIGNMENT CONTINUED

1. State the definition of Ohm's law and it's formula.
2. State what is a conductor.
3. State what is a resistor.
4. State the units and the symbols for current, resistance and voltage

ANY QUESTIONS CLASS?

References

Client challenge. (n.d.). Scribd to the world's documents. Retrieved April 13, 2026, from https://www.scribd.com/presentation/399118994/ohms-law

Kipnis, N. (2009). A law of physics in the classroom: The case of ohm's law. *Science & Education*, *18*(3-4), 349-382. https://doi.org/10.1007/s11191-008-9142-x

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Saslow, W. M. (2002). Ohm's law: Electric current is driven by Emf, and limited by electrical resistance. *Electricity, Magnetism, and Light*, 281-335. https://doi.org/10.1016/b978-012619455-5.50007-3

Thony DOT christie AT t-online DOT de. (2015, May 9). *Ohm sweet ohm*. The Renaissance Mathematicus. https://thonyc.wordpress.com/2015/05/06/ohm-sweet-ohm/


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