	School:		**Grade Level:**	**7**
	Teacher:		**Learning Area:**	**TLE**
	Teaching Dates and Time:		**Quarter:**	**Fourth**
			Week:	**Week 6-Day 2**

I. CONTENT, STANDARDS AND LEARNING COMPETENCIES		***ANNOTATIONS***
A. CONTENT STANDARDS	The learners demonstrate an understanding of the concepts and principles in performing mensuration and calculations.	
B. PERFORMANCE STANDARDS	The learners perform mensuration and calculations following safety precautions	
C. LEARNING COMPETENCIES	**Learning Competency** Interpret the readings in different measuring instruments.	
D. LEARNING OBJECTIVES	**Learning Objectives** At the end of the lesson, the students are expected to: 1. Explain the function and uses of volt-ohm-milliammeter, tachometer, oscilloscope, and ampere meter. 2. Identify the parts of the volt-ohm-milliammeter, tachometer, oscilloscope, and ampere meter. 3. Interpret the readings of volt-ohm-milliammeter, tachometer, oscilloscope, and ampere meter.	
I. CONTENT		
Scale Reading		
II. LEARNING RESOURCES		
A. REFERENCES		

B. OTHER LEARNING RESOURCES	Analog multi meter parts and functions (Part 1). (2021, October 25). YouTube. https://youtu.be/6UhX893En6A?si=vsmfbMV2TCQFeFBL Analog multimeter AC & DC voltage reading Part 3. (2021, October 26). YouTube. https://youtu.be/j9jxh8Hjm-8?si=HLCLHrjaIyK5pN2Z Analog multimeter DC current reading Part4. (2021, October 26). YouTube. https://youtu.be/YRmeMa5j1qI?si=zfbgd6ngcwwmfXOk Analog multimeter resistance reading Part 2. (2021, October 25). YouTube. https://youtu.be/rBPw5zC1qCQ?si=s2LT_GVMFkuhXqJO Computer Lesson 101 - Tagalog. (2021). How to Measure Current (Amperes) using Analog Multi-meter [Video]. YouTube. https://www.youtube.com/watch?v=CcfQFqcMa7U Fluke. (n.d.). What is a digital multimeter? https://www.fluke.com/enin/learn/blog/electrical/what-is-a-digital-multimeter# James Gatlin. (2024). How to use a multimeter like a Pro, the ultimate guide [Video]. YouTube. https://www.youtube.com/watch?v=0loXukB302Q Joy, A. T. (2024). How to use a multimeter, types, components and more. Tameson.com. https://tameson.com/pages/multimeter Kuhlman, J. (2024). How to Read a Multimeter (with Pictures) - wikiHow. wikiHow. https://www.wikihow.com/Read-a-Multimeter Source of Skills. (2023). How to use analog multimeter | Analog multimeter tutorial | Check AC volt with analog multimeter [Video]. YouTube. https://www.youtube.com/watch?v=z8U9ny6ZPKg T, A. (2017). Volt-Ohm-Milli-Ammeter (VOM). Circuit Globe. https://circuitglobe.com/volt-ohm-milli-ammeter-vom.html

III. TEACHING AND LEARNING PROCEDURE

BEFORE/PRE-LESSON PROPER

ACTIVATING PRIOR KNOWLEDGE	**Key Concepts and Functions:** 1. **What is a VOM?** ○ The **Volt-Ohm-Milliammeter (VOM)** is a handheld device used to measure three	

primary electrical properties: **Voltage**, **Current**, and **Resistance**.
    - It can be used to diagnose problems in electrical circuits by providing precise readings of these properties.
2. **Functions of the VOM:**
    - **Voltage (V)**: Measures the potential difference across two points in a circuit. It can be set to measure either DC (Direct Current) or AC (Alternating Current) voltage.
    - **Current (A, mA)**: Measures the flow of electrical charge in a circuit. It requires the VOM to be connected in series with the component to measure current.
    - **Resistance (Ω)**: Measures the resistance of a component or circuit. It is measured by placing the VOM across the component, and the current is cut off during this process.

Review of Procedures for Using the VOM:

1. **Measuring Voltage:**
    - Set the VOM to the appropriate voltage mode (DC or AC).
    - Place the probes across the two points where voltage needs to be measured.
    - The VOM will display the potential difference in volts (V).
2. **Measuring Current:**
    - Set the VOM to the appropriate current mode (DC or AC).
    - Break the circuit and connect the VOM in series with the load or circuit component.
    - The VOM will display the current in amperes (A) or milliamperes (mA).
3. **Measuring Resistance:**
    - Set the VOM to the resistance (Ω) mode.
    - Disconnect the power supply before measuring resistance.
    - Place the probes across the component to be measured, and the VOM will display the resistance value in ohms (Ω).

Key Points to Remember:

- **Correct Range Selection**: Always ensure you select the correct range for measuring voltage, current, or

	resistance. Using an incorrect range can damage the VOM or provide inaccurate readings.
	● **Series vs. Parallel Connections**:
	  ○ **Current** must be measured in series with the component or circuit.
	  ○ **Voltage** must be measured in parallel across the component or circuit.
	  ○ **Resistance** is measured across the component with the power off in the circuit.
	
	Reflection and Learning Check:
	1.Why is it important to choose the correct range and mode on the VOM?
	
	2.What might happen if you measure current in parallel with the circuit instead of in series?
	
	3.How does the VOM help in diagnosing electrical issues?
		ANSWER
		1. Selecting the wrong range or mode could lead to incorrect readings, or worse, damage to the multimeter or the circuit.
		2. If you place the VOM in parallel when measuring current, it can cause a short circuit, potentially damaging the device and the circuit.
		3. The VOM helps identify problems like short circuits, incorrect voltage levels, or faulty components by providing accurate readings of key electrical properties.

LESSON PURPOSE/INTENTION	**Key Concepts:**
	
	1. **Types of Measuring Instruments**:
	  ○ **Voltmeters**: Used to measure the **voltage** (or potential difference) across two points in a circuit. Typically, voltmeters are connected in **parallel**.
	  ○ **Ammeters**: Used to measure the **current** flowing through a circuit. Ammeters are	

	connected **in series** with the component whose current is being measured. ○ **Multimeters**: Versatile instruments that can measure **voltage, current, and resistance**. Multimeters can be set to different modes (voltage, current, or resistance) depending on what is being measured. ○ **Thermometers**: Used to measure **temperature**, either in Celsius, Fahrenheit, or Kelvin. 2. **Correct Usage of Measuring Instruments**: ○ **Voltage**: Ensure the voltmeter is connected in parallel with the component to measure the potential difference. ○ **Current**: Ensure the ammeter is connected in series with the load to measure current flow. ○ **Resistance**: The resistance must be measured with the circuit powered off to avoid inaccurate readings and potential damage. 3. **Interpreting Readings**: ○ Understanding **units of measurement** (volts, amperes, ohms, etc.) is critical for interpreting readings. ○ **Analog vs. Digital Displays**: Be able to interpret both **analog gauges** (with a needle) and **digital displays** (numerical readings). ○ **Error Handling**: Recognizing when readings are incorrect due to improper setup, overload, or other issues. 4. **Factors Affecting Readings**: ○ Environmental factors, calibration errors, or faulty components can sometimes distort measurements. ○ Knowing how to **properly zero** or **calibrate** instruments is vital to ensure accurate readings. **Why This Lesson is Important:** ● **Safety**: Accurate interpretation of readings helps prevent accidents or damage to electrical components or measuring devices. ● **Troubleshooting**: Knowing how to interpret instrument readings is essential for diagnosing issues in electrical circuits and systems. ● **Practical Application**: In fields such as electronics, engineering, physics, and even in everyday life, understanding how to use and interpret measuring instruments is crucial.	
LESSON LANGUAGE PRACTICE	**Vocabulary** 1. **Voltage (V)**:	

- The potential difference between two points in a circuit, measured in **volts** (V). It is often measured using a **voltmeter**.

2. **Current (I)**:
   - The flow of electric charge through a conductor or circuit, measured in **amperes** (A). **Ammeters** are used to measure current.
3. **Resistance (R)**:
   - The opposition to the flow of current in a circuit, measured in **ohms** (Ω). A **multimeter** is commonly used to measure resistance.
4. **Ohm's Law**:
   - A fundamental principle that states the relationship between voltage (V), current (I), and resistance (R) in a circuit: **V = I × R**.
5. **Multimeter**:
   - A versatile tool used to measure multiple electrical properties, such as **voltage**, **current**, and **resistance**. It has different modes for each measurement type.
6. **Voltmeter**:
   - An instrument specifically designed to measure the **voltage** across two points in a circuit. It is connected **in parallel** with the component.
7. **Ammeter**:
   - An instrument used to measure **current** in a circuit. It is connected **in series** with the component whose current is being measured.
8. **Analog Display**:
   - A type of meter that uses a **needle** to point to a reading on a scale. Commonly used in older or simpler measuring instruments.
9. **Digital Display**:
   - A type of meter that provides a **numerical reading** in digital format. It is commonly used in modern instruments, such as digital multimeters.
10. **Accuracy**:

- The closeness of a measurement to the true or accepted value. Accurate readings are essential for diagnosing circuit problems.

11. **Calibration**:

- The process of adjusting an instrument to ensure its readings are correct, often by comparing it to a known standard.

12. **Overload**:

- A condition that occurs when a measurement exceeds the range of the instrument, potentially causing incorrect readings or damage to the device.

13. **Range**:

- The set of values that an instrument is capable of measuring. For example, a multimeter may have different ranges for voltage, current, and resistance.

14. **Short Circuit**:

- An unintended connection that allows current to flow through a path of lower resistance, often causing excessive current flow and potentially damaging the circuit.

15. **Open Circuit**:

- A break in a circuit that prevents current from flowing. It can result in no reading of current or voltage.

16. **Zeroing**:

- The process of setting an instrument to read zero when there is no input, ensuring that the readings are accurate when measuring components.

17. **Power (P)**:

- The rate at which energy is used or transferred in an electrical circuit. It is calculated using the formula **P = V × I**, measured in **watts (W)**.

18. **Continuity**:

- The ability of an instrument to detect whether a circuit is complete (closed). It is commonly tested using a multimeter in continuity mode.

19. **Test Leads**:

- The **wires** or **probes** attached to a measuring instrument, used to connect it to the circuit or component being measured.

20. **Circuit Breaker**:

- A safety device in electrical systems that automatically interrupts the flow of current in case of an overload or short circuit.

	Key Concepts: • **Units of Measurement**: Understanding the units used for different readings is crucial for interpretation (volts, amperes, ohms, etc.). • **Instrument Mode**: Knowing how to set the correct mode on an instrument (e.g., DC or AC, voltage, current, resistance) is essential for accurate readings. • **Instrument Limits**: Recognizing the limits or range of the instrument helps to prevent errors due to overloading or incorrect readings.	
DURING/LESSON PROPER		
READING THE KEY IDEA/STEM	**C. SCALE of VOM** Multimeters can have different types of scales to display these measurements, depending on whether they are analog or digital. **1. Analog multimeters** use a needle and a printed scale to display measurements. The types of scales found in analog multimeters include: ● **Voltage (V) Scale:** Indicates the voltage measurement. Separate scales are typically provided for AC (alternating current) and DC (direct current) voltage measurements. ● **Current (A) Scale:** Indicates the current measurement. Similar to the voltage scale, there are separate scales for AC and DC current. ● **Resistance (Ω) Scale:** Indicates the resistance measurement. The resistance scale often has a non-linear progression due to the nature of how resistance is measured. ● **Decibel (dB) Scale:** Used for measuring audio signals, particularly in telecommunications and audio equipment testing. ● **Continuity Scale:** Indicates if there is a continuous path in the circuit. This is often a simple pass/fail indication. **2. Digital Displays** Digital multimeters (DMMs) have numeric displays that show the measurement values directly. The main types of measurement functions in a digital multimeter include: ● **Voltage (V) Display:** Displays the voltage reading, selectable for AC and DC measurements. ● **Current (A) Display:** Displays the current reading, also selectable for AC and DC measurements. ● **Resistance (Ω) Display:** Shows the resistance value directly. ● Continuity Indication: Often provided as an audible beep when a continuous path is detected.	**How to use Analog Multimeter?** How to use analog multimeter |analog multimeter tutorial |Check AC volt with analog multimeter. (2023, September 3). YouTube. https://youtu.be/z8U9ny6ZPKg?si=kWfeqZhbCaKhE44i **How to use Digital Multimeter?** How to use a multimeter like a pro, the ultimate guide. (2024, January 21). YouTube. https://youtu.be/0loXukB302

	● **Capacitance (F) Measurement:** Some digital multimeters include a capacitance measurement function. ● **Frequency (Hz) Measurement:** Digital multimeters may also measure the frequency of an electrical signal. ● **Temperature (°C/°F) Measurement:** Some advanced multimeters can measure temperature using a thermocouple probe. **D. TYPES OF SCALE IN ANALOG VOM**	Q?si=WfAojmcw4n8NHWgr

Scale definition	Usage	Characteristics
● A LOGARITHMIC SCALE is one in which the spacing between each mark increases logarithmically. This means that each successive unit of measurement represents a tenfold increase in quantity.	● Typically used for Measuring resistance and Sometimes for decibel scales in Audio equipment	● Variable Intervals: The distance between units increases as the value increases. For example, the space between 1 and 10 is the same as the space between 10 and 100. ● Handling Large Ranges: Useful for measuring quantities that cover a large range of values, making it possible to represent both very small and very large values on the same scale. ● Example: In a resistance measurement, the scale might start with very small intervals for lower resistance values and expand to larger intervals for higher resistance values.
● A LINEAR SCALE is one in which the spacing between each mark is consistent across the entire	● Typically used for measuring quantities like voltage and current.	● Equal Intervals: Each unit increase corresponds to the same amount of physical

	range. This means that each unit of measurement is represented by the same physical distance on the scale.		movement of the needle. ● Ease of Reading: Easier to read when measuring values that change linearly. ● Example: If the scale ranges from 0 to 10 volts, the distance between 1 and 2 volts is the same as the distance between 9 and 10 volts.	
DEVELOPING and DEEPENING UNDERSTANDING OF THE KEY IDEA/STEM	**Materials Needed:** ● **Multimeters** (digital or analog) ● **Power sources** (e.g., battery packs or power supplies) ● **Various circuit components** (e.g., resistors, light bulbs, wires) ● **Circuit boards** or **breadboards** ● **Instruction sheets** with step-by-step directions **Activity Directions:** 1. **Form Groups**: ○ Divide the class into groups of **3-4 students**. Each group will work together to set up and test circuits, interpret readings, and troubleshoot based on their results. 2. **Distribute Materials**: ○ Give each group a **multimeter**, a set of **resistors**, **wires**, a **battery** (or power source), and any other relevant circuit components. Provide **instruction sheets** for each measuring device (voltmeter, ammeter, multimeter). 3. **Task 1: Measure Voltage**			

- **Objective**: Each group will measure the voltage across a resistor in a simple series circuit using a **voltmeter**.
- **Steps**:
  - Set up a simple series circuit with a resistor and a power source.
  - Use the **voltmeter** to measure the voltage across the resistor.
  - Record the reading.
- **Questions**:
  - What is the voltage across the resistor?
  - Is the voltage reading what you expected? Why or why not?

4. **Task 2: Measure Current**
   - **Objective**: Measure the current flowing through the same circuit using an **ammeter**.
   - **Steps**:
     - Set up the circuit to include the **ammeter** in series with the resistor.
     - Record the current reading.
   - **Questions**:
     - What is the current in the circuit?
     - Did you place the ammeter in series? What could happen if it were placed incorrectly?
5. **Task 3: Measure Resistance**
   - **Objective**: Measure the resistance of the resistor using a **multimeter**.
   - **Steps**:
     - Switch the multimeter to the **resistance (Ω)** mode.
     - Measure the resistance of the resistor by placing the multimeter probes on both ends of the resistor.
     - Record the reading.
   - **Questions**:
     - What is the resistance of the resistor?
     - Was the resistance value expected based on the resistor's color code?
6. **Task 4: Troubleshoot (Optional)**
   - **Objective**: Identify problems in the circuit (e.g., open circuits, short circuits) using the readings from the measuring instruments.
   - **Steps**:

	▪ Intentionally alter the circuit by removing or changing a component (e.g., disconnecting a wire). ▪ Use the voltmeter, ammeter, or multimeter to observe changes in the readings. ▪ Diagnose any issues with the circuit (e.g., if no current is flowing, the circuit is open). ○ **Questions**: ▪ Did the readings change when the circuit was modified? ▪ What do the changes in the readings indicate about the circuit? 7. **Discussion and Conclusion**: ○ After completing all tasks, gather the groups together for a **class discussion**. ○ Ask each group to present their findings: ▪ What did they measure (voltage, current, resistance)? ▪ Were their readings as expected? If not, why might that be? ▪ What did they learn from troubleshooting the circuit? **Group Reporting Template:** • **Group Name**: • **Circuit Diagram**: (Draw the setup of the circuit) • **Voltage Measurement**: (Record voltage reading) • **Current Measurement**: (Record current reading) • **Resistance Measurement**: (Record resistance reading) • **Troubleshooting Results**: (Describe any problems identified and how they were resolved)	
AFTER AFTER/POST-LESSON		
MAKING GENERALIZATIONS AND ABSTRACTIONS	Worksheet Synthesis/Extended	

	What you have learned In a one sheet of paper write something you understand about the lesson we discussed today.	
EVALUATING LEARNING	**Directions:** Choose the correct answer for each question. **1.What does a voltmeter measure in a circuit?** A) Current B) Voltage C) Resistance D) Power **2.If the ammeter reads 0 A (amps), what could be the possible reason?** A) The circuit is closed, and current is flowing. B) The ammeter is connected in parallel. C) The circuit is open, and current is not flowing. D) The resistor is too large. **3.When using a multimeter to measure resistance, which mode should the multimeter be set to?** A) Voltage mode B) Current mode C) Resistance mode (Ω) D) Continuity mode **4.What is the unit of measurement for current?** A) Volts (V) B) Amperes (A) C) Ohms (Ω) D) Watts (W) **5.What could cause a multimeter to display an infinite resistance (open circuit) when measuring a resistor?** A) The resistor is shorted. B) The resistor is faulty and has no connection. C) The circuit is closed correctly. D) The battery in the multimeter is low.	ANSWER 1.B 2.C 3.C 4.B 5.B
ADDITIONAL ACTIVITIES FOR APPLICATION OR REMEDIATION (IF APPLICABLE)	**Directions:** • Read each question carefully and answer it based on your understanding of how different measuring instruments work.	

	• Draw circuit diagrams where necessary to support your answers. • Provide the correct units for the measurements. **Questions:** 1.You are using a voltmeter to measure the voltage across a 10-ohm resistor in a circuit powered by a 12V battery. The voltmeter reads 8V. • What does the reading of 8V indicate about the circuit? • What could be the cause of the lower-than-expected voltage reading? 2.You set up a simple circuit with a 100-ohm resistor and a 9V battery. You place an ammeter in series with the resistor and measure the current. The ammeter reads 0.09 A. • What is the current flowing through the circuit? • Is this value what you would expect from Ohm's Law? (Use Ohm's Law: I=VRI = \frac{V}{R}I=RV) 3.You use a multimeter to measure the resistance of a 220-ohm resistor. The multimeter shows a resistance value of "OL." • What does the reading "OL" mean? • What could be the possible reasons for this reading? 4.In a simple circuit, you measure the voltage across a resistor and get a reading of 0V, even though the power supply is working. The ammeter reads 0A. ○ What could be the reason why the voltage and current are both 0? ○ What should you check in the circuit to troubleshoot the issue? 5.You are measuring the current in a circuit using an ammeter. The reading shows 0.5 A when the circuit is supposed to be carrying 1 A based on the components and the power supply. ○ What could be the reason for the lower-than-expected current reading? ○ How would you troubleshoot to resolve the issue?	
REMARKS		
REFLECTION		

Prepared by:

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Reviewed by:

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Master Teacher/Head Teacher