7/8

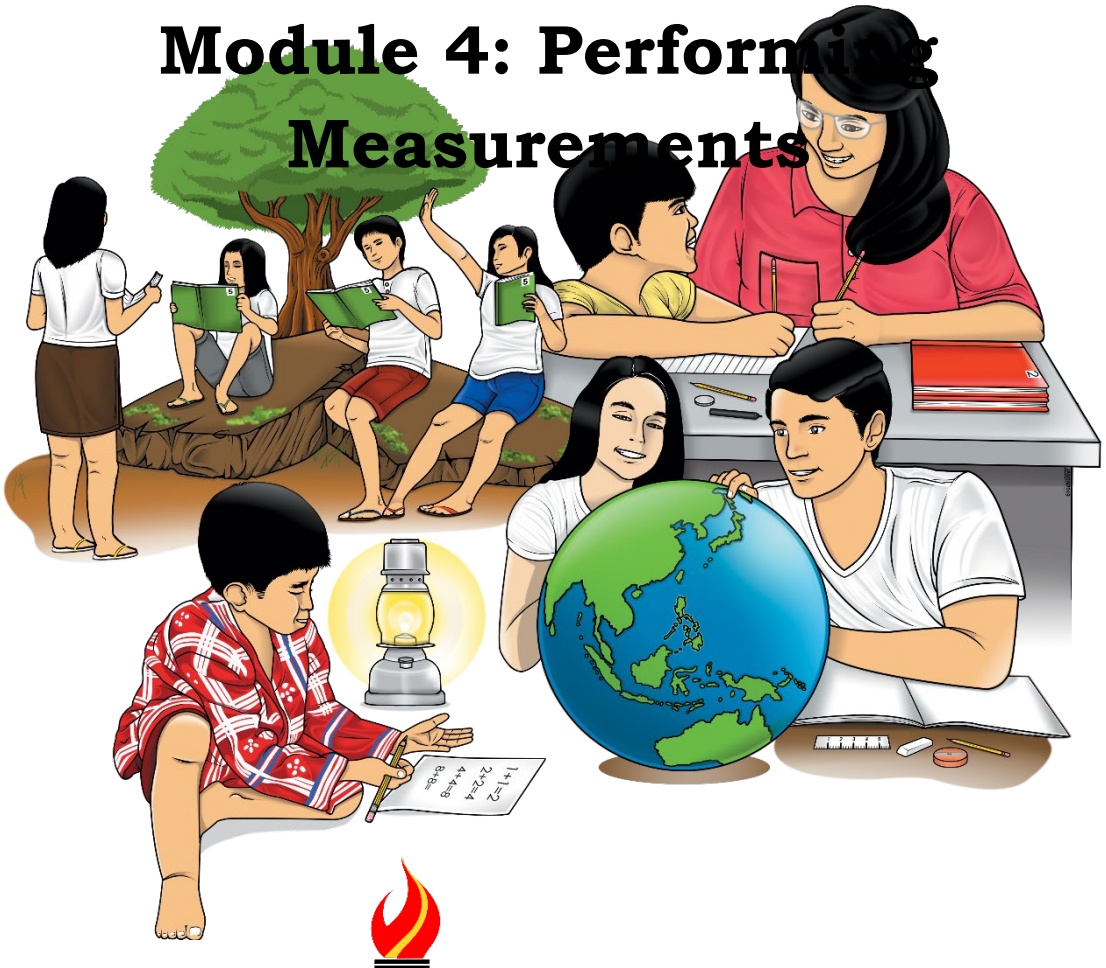
DepED
DEPARTMENT OF EDUCATION

Technology and Livelihood Education

Exploratory Course

Electrical Installation and Maintenance

Module 4: Performing Measurements



ALTERNATIVE DELIVERY MODE
ADM

Technology and Livelihood Education – Grade 8
Alternative Delivery Mode
Module 4: Industrial Arts - Electrical Installation and Maintenance (EIM)
First Edition, 2020

Published by the Department of Education
Secretary: Leonor Magtolis Briones
Undersecretary: Diosdado M. San Antonio

Development Team of the Module

Writer:	Marlon E. Delabahan
Editors:	Avelina C. Duquesa, Nilo R. Verdon, Rowenah S. Timcang, Bernie R. Pamplona, Junel M. Anino, Grace A. Ando, Jeho Ranin
Reviewers:	Elizabeth A. Bautista, Flaviano L. Yparraguirre, Rico E. Geonzon, Enriquito T. Fideles, Jr., Mark Carlo D. Buyao, Salvador F. Movilla, Rodgene L. Malunes
Illustrator:	Eduardo D. Ayo Jr. and Franz Vincent Roman T. More
Layout Artist:	Bernie R. Pamplona, Junel M. Anino, Joel F. Amerila
Management Team:	Francis Cesar B. Bringas Isidro M. Biol Jr. Maripaz F. Magno Josephine Chonie M. Obseñares Romeo O. Aprovechar Rayfrocina T. Abao Avelina C. Duquesa Nilo R. Verdon

Printed in the Philippines by Department of Education – CARAGA Region

Office Address: J.P. Rosales Ave. Brgy. Dagohoy, Butuan City
Telefax: (085) 817-7141
E-mail Address: caraga@deped.gov.ph

7/8

Technology and Livelihood Education

Exploratory Course

Electrical Installation and Maintenance(EIM)

Module 4: Performing Measurements

DepED
DEPARTMENT OF EDUCATION

Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

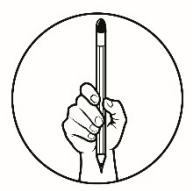
What I Need to Know

This module was designed and written with you in mind. It is given to help you master and carry out measurements and calculations. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module has one lesson that focuses on carry out measurements and calculations. (**TLE_IAE17/8MC-Od-2)**

After going through this module, you are expected to:

- use appropriate measuring devices for specific tasks; and
- compute for required data.



What I Know

Pretest
Multiple Choice
Directions: Choose the letter of the correct answer. Write the chosen letter in your activity sheet.

1. Which part of a multimeter is usually coded with blank as negative and red as positive?
   A. Ohmmeter Scale
   B. Scale Panel
   C. Test Probes
   D. Zero Ohm Adjuster Knob

2. Which instrument is used to measure voltage?
   A. Ammeter
   B. Ohmmeter
   C. Tester
   D. Voltmeter

3. Which measuring device has 3 testers packed into one?
   A. Foot Rule
   B. Multimeter
   C. Pull-push Rule
   D. Voltmeter

4. Which is used to measure resistance value?
   A. Ammeter
   B. Multimeter
   C. Ohmmeter
   D. Voltmeter

5. Which tool or device is used to measure length and draw straight lines?
   A. Compass
   B. Foot Rule
   C. Multimeter
   D. Voltmeter

6. How many centimeters are there in 1 decimeter?
   A. 10 centimeters
   B. 12 centimeters
   C. 14 centimeters
   D. 24 centimeters

7. How many inches are there in 1 foot?
   A. 6 inches
   B. 8 inches
   C. 10 inches
   D. 12 inches

8. How many millimeters in 1 centimeter?
   A. 10 millimeters
   B. 12 millimeters
   C. 16 millimeters
   D. 24 millimeters

9. What is the equivalent measurement of 10 millimeters to centimeter?
   A. 1 centimeter
   B. 2 centimeters
   C. 3 centimeters
   D. 4 centimeters

10. What is the equivalent of 1 yard to inches?
   A. 18 inches
   B. 24 inches
   C. 28 inches
   D. 36 inches

11. How many yards are there in 6 feet?
   A. 2 yards
   B. 3 yards
   C. 4 yards
   D. 5 yards

12. What is the resistance value if the reading is 50X1?
   A. 50Ω
   B. 52Ω
   C. 53Ω
   D. 55Ω

13. The reading of a resistor is 20X10, what is the resistance value?
   A. 150Ω
   B. 200Ω
   C. 210Ω
   D. 230Ω

14. What is the equivalent measurement of 6 inches to decimeters?
   A. 10 decimeters
   B. 20 decimeters
   C. 30 decimeters
   D. 60 decimeters

15. How many inches are there in 3 feet?
   A. 12 inches
   B. 20 inches
   C. 24 inches
   D. 36 inches

What's In

Directions: Inside **Heart A** are jumbled letters. Arrange the letters to form a word pertaining to measurements and calculations. Then, write the word inside **Oval B**. Use your activity sheet.

	Heart A	**Oval B**
1.	ACLES	
2.	TERME	
3.	ESTT	
4.	REGAN	
5.	NCESHI	

What's New

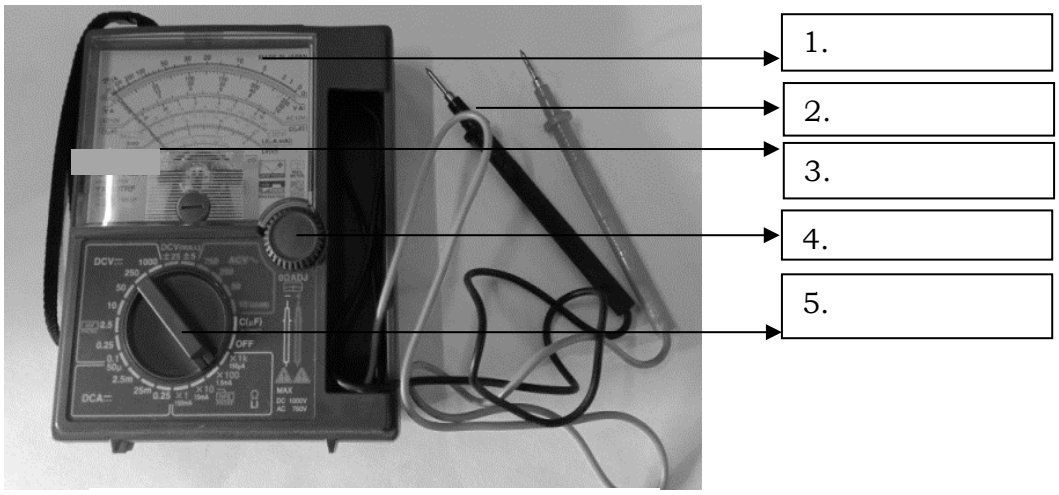
Activity I

Directions: Identify the longest measurement in each item. Write the letter of the correct answer in your activity sheet.

1.	A.1 centimeter	B. 5 millimeters	C. 1 inch	D. 3 millimeters
2.	A. 2 centimeters	B. 8 millimeters	C.10 millimeters	D. 3 centimeters
3.	A. 12 inches	B. 5 inches	C. 3 centimeter	D. 9 inches
4.	A. 8 meters	B. 6 meters	C. 20 meters	D. 12 meters
5	A. 7 inches	B. 5 inches	C.2 inches	D.8 inches

Activity II

Directions. Identify the parts of a multimeter. Choose your answer from the ***treasure box*** below. Write it in your activity sheet.

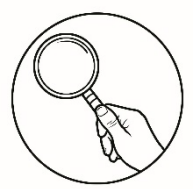


Source: Original photo by Marlon E. Delabahan

TREASURE BOX

Selector Range Zero Ohm Adjuster Knob Scale Panel

Test Probes Needle Pointer



What is It

Lesson 2 Performing Measurements and Calculations

Unlocking of Technical Terms

Measurement - the size, length, or amount of something, as established by measuring.

Calculation – a mathematical determination of the size or number of something.

Graduation – the action of dividing into degrees or other proportionate divisions on a graduation.

Voltmeter – an instrument used to measure voltage.

Ohmmeter – an instrument used to measure resistance.

Non-linear - means that the value of one calibration may not be the same with the others.

Ohm – a unit of resistance.

Resistance – a characteristic of a resistor to resist or oppose the flow of current in the circuit.

Voltage – an electromotive force or potential difference expressed in volts.

Multimeter – an instrument designed to measure electric current, voltage, and resistance.

Ammeter – an instrument for measuring electric current in amperes.

Needle Pointer – the value of electrical quantity that has been measured.

Scale Panel - usually calibrated where it serves as the basis for reading the value.

Zero Ohm Adjuster Knob –used to adjust if ever the pointer fails to point to zero.

Range Selector – a rotary switch of different ranges such as RX1, RX10, RX100, RX1K, and RX10K

Test Probes – it is the input portion of a multimeter usually coded with red and black: red means positive and black is negative.

Introduction

Do you have a ruler or a foot rule? Try to look at it. What are your observations? You will see short and long calibrated lines with equal distances. In electrical works, like wiring connections, proper measurements must really be observed for an excellent output. Measurements and simple calculations are equally important in the field of electricity.

Here, you will be learning how to get the value of each calibration of the foot rule, to convert units of measurements and to apply measurements later in real-life situation.

When you measure something, you will be using a system of measurements both English and metric. System of measurement is a set of units which you can use to give the value of the thing being measured.

System of Measurement

- **English System** –a system of weights and measures which are commonly used worldwide, such as *inch, yard, foot, mile, cup, gallon and others.*
  Example: When you want to measure the length of a pencil in an inch, you are using the English system.

- **Metric System** –a system which uses *millimeter, centimeter, decimeter, meter, kilometer and others.*
  Example: When you asked by your teachers about the distance from your home to school, you probably say it in kilometer or in meter. With this, you are using the metric system.

Conversion of Unit of Measures

- Conversion of English units

1 foot (ft) = 12 inches
1 foot (ft) = 3 yards
1 yard = 36 inches

- Conversion of Metric units

1 centimeter = 10 millimeter
1 decimeter = 10 centimeter
1 meter = 10 decimeter
1 kilometer = 1000 meter

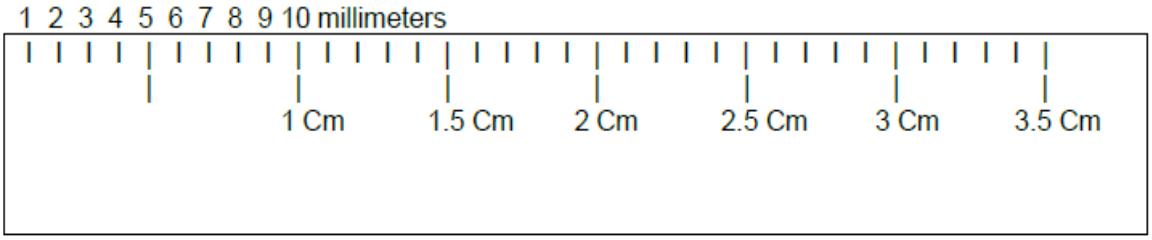
- Conversion from English to Metric units

1 inch = 2.54 centimeter
0.39 inch = 1 centimeter
1 foot = 30.48 centimeter

3.28 feet = 1 meter
I yard = 0.91 meter
1.09 yards = 1 meter
1 mile = 1.61 kilometers
0.62 miles = 1 kilometer

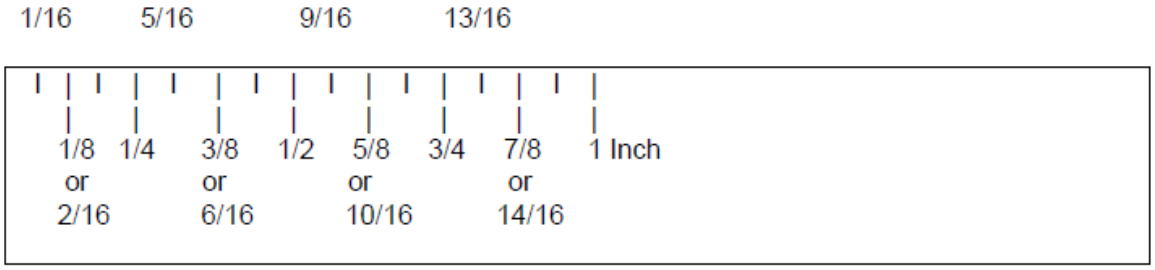
Take a look at these!

Millimeter Graduation



Note: As shown above, there are 10 millimeters in 1 centimeter, 0.5 centimeter has 5 millimeters.

Inch Graduation



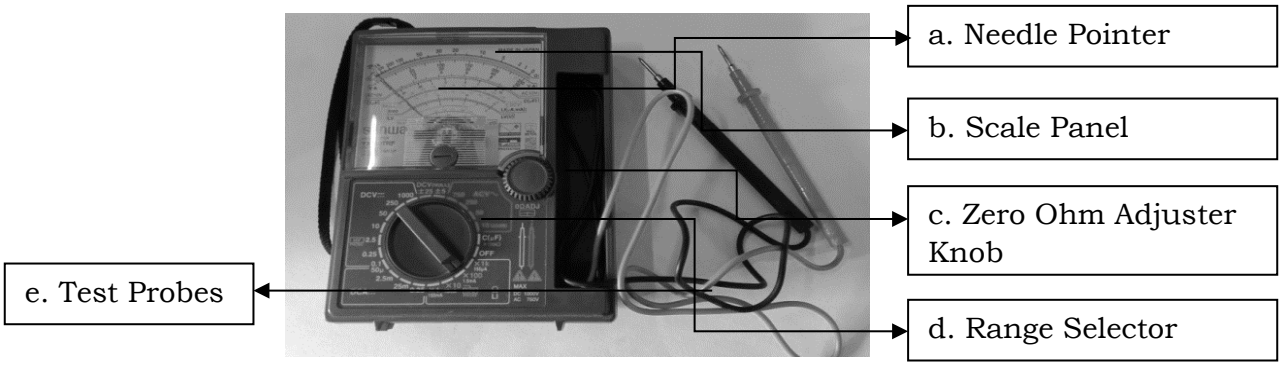
Note: As shown above, first calibration is 1/16, second calibration is 2/16 or 1/8, third calibration is 3/16 and so on.

Measuring Instruments

Multimeter/Voltmeter, Ohmmeter, Milliammeter (VOM)

This is a commonly used measuring instrument in electricity wherein technician cannot perform troubleshooting without it. It's a device that performs 3 functions packed into one – voltmeter, ohmmeter, and ammeter.

Parts of a Multimeter /Multitester



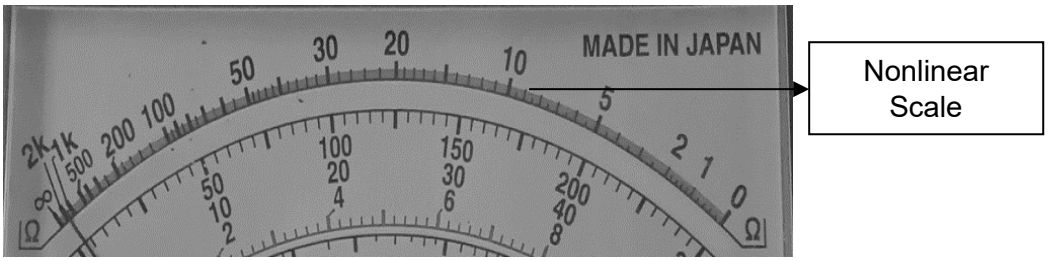
Source: Original photo by Marlon E. Delabahan

A. To get the resistance value of a resistor, you need to use an ohmmeter.

Procedures in interpreting the resistance reading of an ohmmeter.

1. Compute the value per calibration of the ohmmeter scale.

   The ohmmeter scale is nonlinear. This means that the value per calibration may not be the same with the other calibrations. For accurate interpretation of the scale, the value per calibration should be assigned.



Source: Original photo by Marlon E. Delabahan

The illustration shows that the ohmmeter scale is divided into eight areas where reading of the values is based. Several mathematical computations are made to show the manner on how the individual lines are resolved.

These are the following areas:

0-2	2-10	10-20	20-50	50-100	100-200	200-300	300-500

Using this formula,

Value of 1 calibration = line distance/total calibrations

Scale	Line Distance	Total Number of calibration	Computation	Value of Per Calibration
0-2	2	10	2/10	0.2
2-10	8	16	8/16	0.5
10-20	10	10	10/10	1
20-50	30	15	30/15	2.0

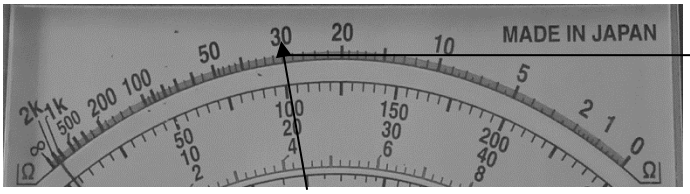
50-100	50	10	50/10	5.0
100-200	100	5	100/5	20
200-300	100	2	100/2	50
300-500	200	2	200/2	100

2. From the selector switch, select appropriate range to be used such as R X 1, R X 10, R X 100, R X 1K, and R X 10K.

3. Before connecting the test probes to the terminals of the component, make sure that the needle pointer falls to zero, if not, make some adjustments.

4. Make sure to have an accurate reading.

Let`s try!



Source: Original photo by Marlon E. Delabahan

If that is the reading, how much is the actual resistance value of the following; Here it is…

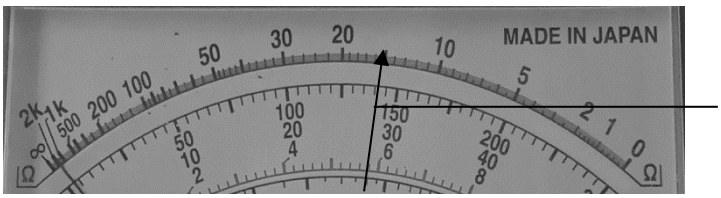
RX1	30X1=30Ω
RX10	30X10=300Ω
RX100	30X100=3000Ω or 3KΩ
RX1K	30X1000=30000Ω or 30KΩ
RX10K	30X10000=300,000Ω or 300KΩ

Remember!

1K = 1000;

1KΩ = 1000Ω

One more try!



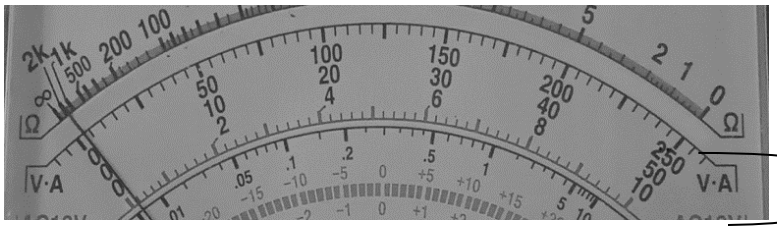
Source: Original photo by Marlon E. Delabahan

If that is the reading, how much is the actual resistance value of the following; Here it is…

RX1	15X1=15Ω
RX10	15X10=150Ω
RX100	15X100=1500Ω or 1.5KΩ
RX1K	15X1000=15,000Ω or 15KΩ

RX10K	15X10000=150,000Ω or 150KΩ

B. To get the voltage value, you need to use a voltmeter.

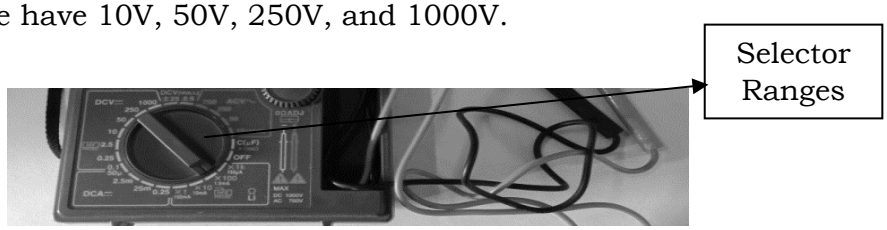


Source: Original photo by Marlon E. Delabahan

In the voltmeter you will see the following scales with corresponding calibration;

- 0-250 scale having 5V per calibration
- 0-50 scale having 1V per calibration
- 0-10 scale having 0.2V per calibration

For the ranges, we have 10V, 50V, 250V, and 1000V.

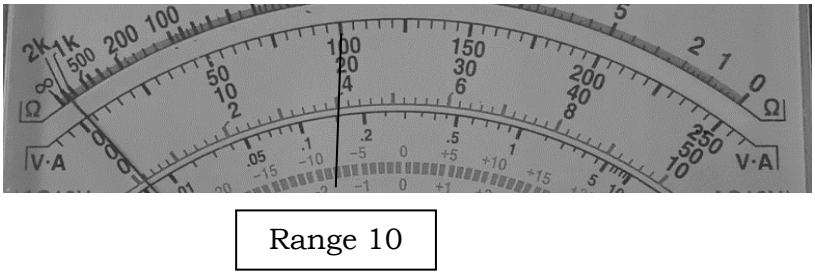


Source: Original photo by Marlon E. Delabahan

How to read the voltmeter scale? Please be guided of the following steps:

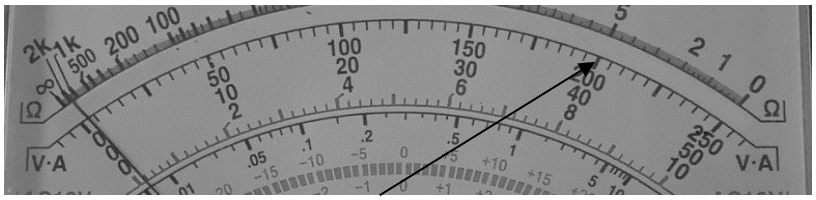
1. Make sure that you are familiar with the basic parts of a multitester.
2. Select the range you wish to use 10V, 50V, 250V, and 1000V. Always remember, set higher/highest range than the voltage you are going to measure especially if the voltage is unknown. This is to prevent damage of your tester and electric shock.
3. Make sure that the range that you will be using is the same scale you will be reading. For example, if you set range 10 the scale is actually 0-10.
4. Read the value accurately.

Let`s try!



Source: Original photo by Marlon E. Delabahan

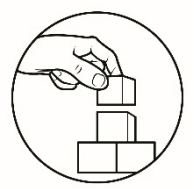
What is the actual reading? The answer is 4.2V.



Range 250

Source: Original photo by Marlon E. Delabahan

What is the actual reading? It`s 200V.



What's More

A. Directions: ***English System or Metric System***. Write **ES** if the unit used is an English system and **MS** if it is a metric system. Write your answer in your activity sheet.

_____1. Gallon

_____2. Meter

_____3. Foot

_____4. Yard

_____5. Centimeter

_____6. Kilometer

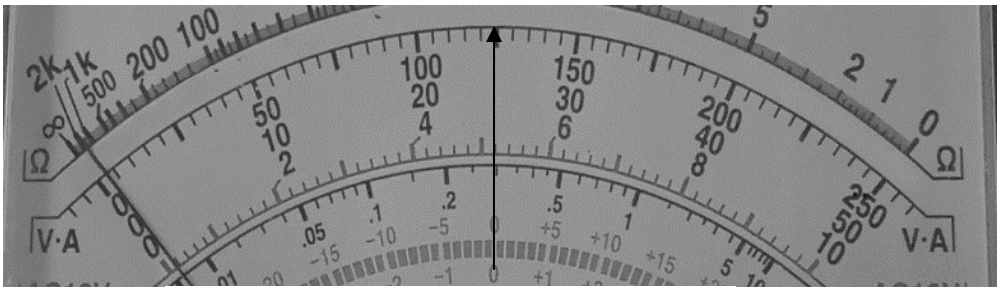
_____7. Decimeter

_____8. Liter

_____9. Mile

_____10. Inch

B. Directions: Voltmeter Reading. Get the voltage of the following ranges. Write your answer in your activity sheet.



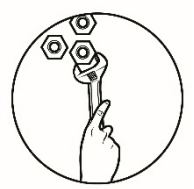
Source: Original photo by Marlon E. Delabahan

Range	Actual Reading
1.0-10	
2. 0-50	
3. 0-250	
4. 0-1000	

What I Have Learned

Activity
Directions: Fill in the blanks with the correct answer. Write it in your activity sheet.

1. _____ is found at the topmost part of the scale panel.
2. The input portion of the ohmmeter is the _____.
3. The ohmmeter reading scale is _____.
4. _____ is used to adjust if the needle pointer fails to point to zero.
5. _____ the lowest range multiplier in an ohmmeter?
6. _____ system uses millimeter, centimeter, decimeter, meter, kilometer and others.
7. 1 inch is equivalent to _____ decimeters.
8. _____ it is usually calibrated where it serves as the basis for reading the value.
9. 30 decimeters is equivalent to _____ inches.
10. 1 yard is equivalent to _____ inches.



What I Can Do

Activity 1

This activity is called **Measure Me!**

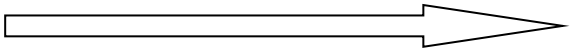
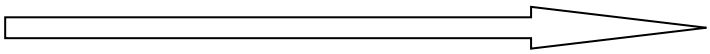
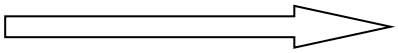
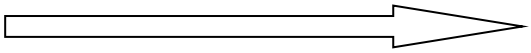
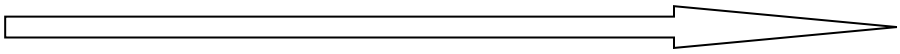
Materials Needed

- Activity Sheet
- Ballpen/Pencil

Tools Needed

- Foot Rule
- Meter Stick
- Pull-push Rule

Directions: Using any of the given measuring tools, get the actual length of the following arrows using "*inch*". Write it in your activity sheet.

1.  = _____
2.  = _____
3.  = _____
4.  = _____
5.  = _____

Activity 2

Directions: Choose at least 5 objects found in your home like ballpen, notebook, etc. Using a ruler or a meter stick, measure its length using "*inch*". Write it in your activity sheet.

1. _____.
2. _____.
3. _____.
4. _____.
5. _____.

Assessment

Post test

Multiple Choice

A. Directions: Choose the letter of the correct answer. Write the chosen letter in your activity sheet.

1. Which instrument is used to measure voltage?
   - A. Ammeter
   - B. Ohmmeter
   - C. Tester
   - D. Voltmeter

2. Which is used to measure resistance value?
   - A. Ammeter
   - B. Multimeter
   - C. Ohmmeter
   - D. Voltmeter

3. Which tool or device is used to measure length and draw straight lines?
   - A. Compass
   - B. Foot Rule
   - C. Multimeter
   - D. Voltmeter

4. Which part of a multimeter is usually coded with blank as negative and red as positive?
   - A. Ohmmeter Scale
   - B. Scale Panel
   - C. Test Probes
   - D. Zero Ohm Adjuster Knob

5. How many centimeters are there in 1 decimeter?
   - A. 10 centimeters
   - B. 12 centimeters
   - C. 14 centimeters
   - D. 24 centimeters

6. Which is a measuring device that has 3 testers packed into one?
   - A. Foot Rule
   - B. Multimeter
   - C. Pull-push Rule
   - D. Voltmeter

7. How many millimeters in 1 centimeter?
   - A. 10 millimeters
   - B. 12 millimeters
   - C. 16 millimeters
   - D. 24 millimeters

8. How many inches are there in 1 foot?
   - A. 6 inches
   - B. 8 inches
   - C. 10 inches
   - D. 12 inches

9. How many yards are there in 6 feet?

A. 2 yards
B. 3 yards
C. 4 yards
D. 5 yards

10. What is the equivalent measurement of 6 inches to decimeter?

A. 10 decimeters
B. 20 decimeters
C. 30 decimeters
D. 60 decimeters

11. What is the resistance value if the reading is 50X1?

A. 50Ω
B. 52Ω
C. 53Ω
D. 55Ω

12. How many inches are there in 3 feet?

A. 12 inches
B. 20 inches
C. 24 inches
D. 36 inches

13. What is the equivalent measurement of a yard to inches?

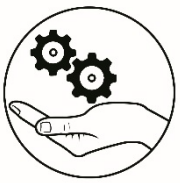
A. 18 inches
B. 24 inches
C. 28 inches
D. 36 inches

14. The reading of a resistor is 20X10, what is its resistance value?

A. 150Ω
B. 200Ω
C. 210Ω
D. 230Ω

15. What is the equivalent measurement of 10 millimeters to centimeter/s?

A. 1 centimeter
B. 2 centimeters
C. 3 centimeters
D. 4 centimeters



Additional Activities

Directions: Below are the parts of a multitester. Give the function of each part. Write it in your activity sheet.

Parts of a multitester	Function/s
1.  *Selector Knob*	
2. 	

Test Probes

3.

Ohmmeter Scale

4.

Zero ohm adjuster knob

5.

Needle Pointer

Answer Key

What I Know	What's In	What's New
1. C 2. D 3. B 4. C 5. B 6. A 7. D 8. A 9. A 10.D 11.A 12.A 13.B 14.D 15.D	1. SCALE 2. METER 3. TEST 4. RANGE 5. INCHES	Act. 1 1. C 2. D 3. A 4. C 5. D Act. 2 1. Scale Panel 2. Test Probes 3. Needle Pointer 4. Zero Ohm Adjuster Knob 5. Selector Range

What's More	What I Have Learned	Assessment
A. 1. ES 2. MS 3. ES 4. ES 5. ES 6. MS 7. MS 8. MS 9. ES 10. ES B. 1. 5.2Ω 2. 25Ω 3. 125Ω 4. 520Ω	1. Ohmmeter Scale 2. Test Probes 3. Non-linear 4. Zero Ohm Adjuster Knob 5. RX1 6. Metric System 7. 10 decimeters 8. Scale Panel 9. 3 inches 10. 36 inches	1. D 2. C 3. B 4. C 5. A 6. B 7. A 8. D 9. A 10. D 11. A 12. D 13. D 14. B 15. A

References

A. Books

Ebalan, Ambrosio E. *Basic Electronics II*. Quezon City: Kalayaan Press Mktg. Ent., Inc. 1999.

Faina, Juanito S. *Basic Transistorized Amplifiers*. Third Edition. Quezon City: National Book Store. 2000

Santos, G. E., and T.B. Tronqued. *Technology and Home Economics*. Quezon City: Phoenix Publishing House, Inc. 1995

Schultz, Mitchel E., *Grob`s Basic Electronics*, 10th Edition 2008

Department of Education. *K to 12 Basic Education Curriculum – Electrical Installation and Maintenance Learning Module.* Pasig City: DepEd, 2013.

Photo Credits

Delabahan, Marlon E. "Multitester" [Original Photo]. Agusan del Norte.2020
Delabahan, Marlon E. "Ohmmeter Scale". [Original Photo]. Agusan del Norte.2020
Delabahan, Marlon E. "Parts of a Multitester" [Original Photo]. Agusan del Norte. 2020.

For inquiries or feedback, please write or call:

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph