Units of Metric Measurement

Unit: Science, Technology, Engineering, and Mathematics (STEM) Skills

Problem Area: Metric System

Lesson: Units of Metric Measurement

Student Learning Objectives.

Instruction in this lesson should result in students achieving the following objectives:

1. **Identify the base unit of linear measure used in the SI metric system.**
2. **Identify three subunits of linear measure used in the SI metric system.**
3. **Measure a given distance in terms of millimeters, centimeters, decimeters, and meters.**

Resources.

The following resources may be useful in teaching this lesson:

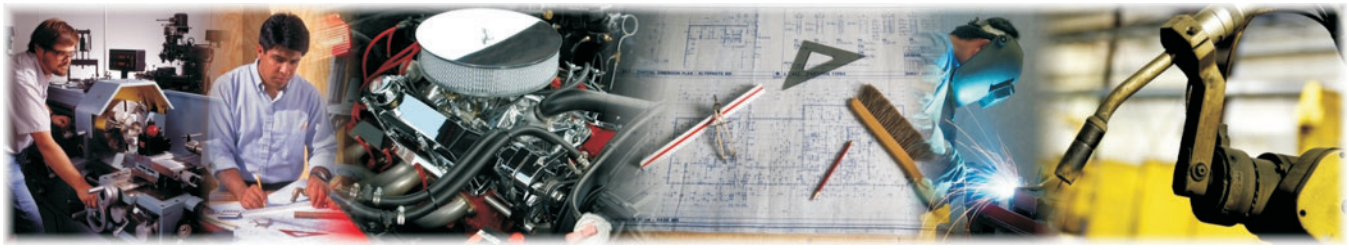
Carman, Robert A., and Hal M. Saunders. *Mathematics for the Trades: A Guided Approach.* Pearson Education, 2010.

"Math League Help Topics," *Math League.* Accessed March 15, 2011. <http://www.mathleague.com/help/help.htm>.

"Math: Metric Measurement," *University of Missouri eThemes.* Accessed March 15, 2011. <http://ethemes.missouri.edu/themes/568>.

"Metric Length," *Math Is Fun.* Accessed March 15, 2011. <http://www.mathsisfun.com/measure/metric-length.html>.

Phagan, R. Jessie. *Applied Mathematics*, 4th ed. Goodheart-Willcox, 2004.



Equipment, Tools, Supplies, and Facilities

- ✓ Overhead or PowerPoint projector
- ✓ Visuals from accompanying masters
- ✓ Copies of sample test, lab sheet, and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials
- ✓ Metric rulers and/or tape measure

Key Terms.

The following terms are presented in this lesson (shown in bold italics):

- ➤ centimeter
- ➤ decimeter
- ➤ meter
- ➤ millimeter
- ➤ SI metric system

Interest Approach.

Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

> *Divide the class into several groups, and provide each group with a duplicate 2D or 3D straight-sided object, such as a cardboard cutout of a polygon or a piece of wood, plastic, or metal. Give metric rulers or tape measures to half the groups and English rulers or tape measures to the other half. See which group can accurately measure the perimeter of the object the fastest. Record the time it takes for each group to complete the measurements. Determine which groups were the quickest and the most accurate. Discuss which groups worked the fastest and why.*

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Identify the base unit of linear measure used in the SI metric system.

Anticipated Problem: What is the base unit of SI metric linear measure, and how does it compare to the lengths of feet and yards?

I. SI metric system

A. The ***SI metric system*** (Systeme Internationale) is a modern standardized form of the metric system that allows people worldwide to have a common measurement system in order to share information accurately.

1. The SI metric system is the most commonly utilized system of measure outside of the United States.
2. The metric system is based on powers of 10.
3. Units are expressed in decimal form instead of fraction form.

B. The base unit of the linear SI metric measurement is the ***meter***.

1. Meter is sometimes spelled "metre."
2. Meter is abbreviated using the letter "m."
3. A meter is slightly longer than 3 feet (about 3 feet and 3½ inches).
4. A meter is slightly longer than 1 yard (1.0929 yards).

Teaching Strategy: *Use VM–A to help students visualize as well as compare and contrast the SI metric system's meter unit of linear measure to the U.S. conventional system's units of linear measure: foot and yard.*

Objective 2: Identify three subunits of linear measure used in the SI metric system.

Anticipated Problem: What linear measure units of the SI metric system can be used to measure lengths that are shorter than 1 meter?

II. Subunits of a meter

A. A ***millimeter*** is a unit of length equal to one thousandth of a meter.

1. Millimeter is abbreviated with the letters "mm."
2. A millimeter is equal to $^{1}/_{1000}$ or 0.001 of a meter.
3. It is roughly equal to the thickness of the wire of a paper clip.

B. A ***centimeter*** is a unit of length equal to one hundredth of a meter.

1. Centimeter is abbreviated with the letters "cm."

2. It is equal to $^1/_{100}$ or 0.01 of a meter.
3. A centimeter is roughly equal to the width of a pencil.

C. A ***decimeter*** is a unit of length equal to one tenth of a meter.

1. Decimeter is abbreviated with the letters "dm."
2. A decimeter is equal to $^1/_{10}$ or 0.1 of a meter.
3. It is roughly equal to the width of a person's hand.

Teaching Strategy: *Use VM–B to help students visualize as well as compare and contrast the SI metric system's meter unit of linear measure: the subunits of decimeter, centimeter, and millimeter.*

Objective 3: Measure a given distance in terms of millimeters, centimeters, decimeters, and meters.

Anticipated Problem: Using a metric ruler or tape measure, what is the length of a line or object in terms millimeters, centimeters, decimeters, and meters?

III. Reading a metric rule or tape measure

A. The smallest marking or graduation is usually a millimeter in length.

B. The numbered markings usually indicate a length of 1 centimeter.

1. 10 millimeters equal 1 centimeter.
2. 10 centimeters equal 1 decameter.

Teaching Strategy: *Use VM–C to help students visualize as well as compare and contrast the length of a decimeter, centimeter, and millimeter. Assign LS–A.*

- **Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the ends of chapters in the textbook may also be used in the Review/Summary.

- **Application.** Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.

- **Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

Answers to Sample Test:

Part One: Matching

1. d
2. a
3. c
4. b
5. e

Part Two: Completion

1. meter
2. pencil
3. paper clip wire
4. your hand
5. smallest
6. SI metric system

Part Three: Short Answer

1. 70 millimeters
   7 centimeters
   0.7 decimeters
   0.07 meters
2. 95 millimeters
   9.5 centimeter
   0.95 decimeters
   0.095 meters
3. 20 millimeters
   2 centimeters
   0.2 decimeters
   0.02 meters

Sample Test

Name _____

Units of Metric Measurement

Part One: Matching

Instructions: **Match the term with the correct definition.**

a. meter
b. decimeter
c. centimeter
d. millimeter
e. SI metric system

_____1. A unit of length equal to one thousandth of a meter

_____2. The base unit of the linear SI metric measurement

_____3. A unit of length equal to one hundredth of a meter

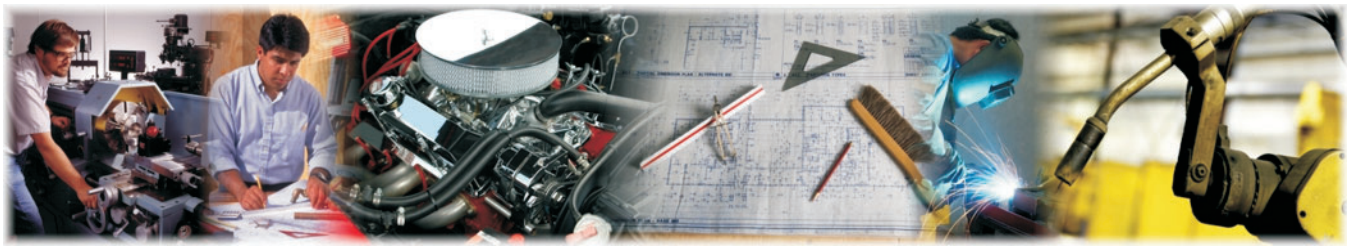
_____4. A unit of length equal to one tenth of a meter

_____5. A modern standardized form of the metric system that allows people worldwide to have a common measurement system in order to share information accurately

Part Two: Completion

Instructions: **Provide the word or words to complete the following statements.**

1. The base unit of the linear SI metric measurement is the _____.
2. The length of a centimeter is roughly the width of a _____.
3. The length of a millimeter is roughly the thickness of _____.
4. The length of a decimeter or roughly equal to the width of _____.
5. On a metric tape measure, the _____ marking or graduation is usually a millimeter in length.



6. The _____ is the most commonly utilized system of measure outside of the United States.

Part Three: Short Answer

Instructions: **Answer the following. (Use a metric ruler or tape measure to identify the length of each line. Record your answer in terms of millimeters, centimeters, decimeters, or meters as indicated.)**

1. The length of the line below is:

   _____

   _____ millimeters

   _____ centimeters

   _____ decimeters

   _____ meters

2. The length of the line below is:

   _____

   _____ millimeters

   _____ centimeters

   _____ decimeters

   _____ meters

3. The length of the line below is:

   _____

   _____ millimeters

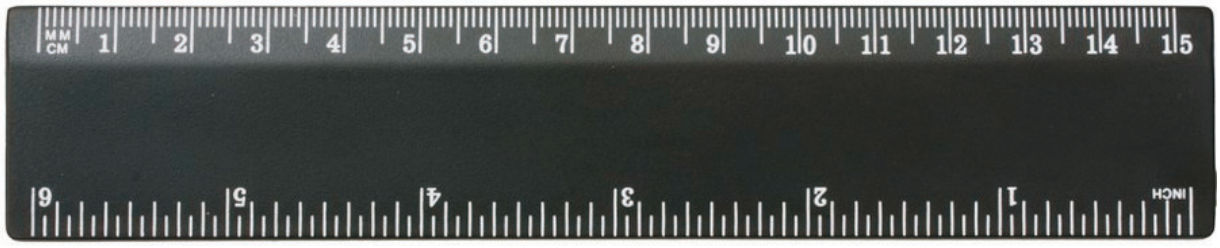
   _____ centimeters

   _____ decimeters

   _____ meters

SI METRIC MEASURING SYSTEM

- Based on the powers of 10
  - 1 meter (m) = 10 decimeters
  - 1 decimeter (dm) = 10 centimeters
  - 1 centimeter (cm) = 10 millimeters (mm)



- Units expressed in decimal form
  - 1 decimeter = 0.10 meters
  - 1 centimeter = 0.01 meters
  - 1 millimeter = 0.001 meters
- A meter is about 3 feet and 3½ inches or slightly longer than one yard (1.0929 yards).

SUBUNITS OF THE SI METRIC SYSTEM

- Millimeter (mm)
  - 0.001 ($^1/_{100}$) of a meter
  - Roughly the thickness of a paperclip wire

- Centimeter (cm)
  - 0.01 ($^1/_{100}$) of a meter
  - Roughly the width of a pencil

- Decimeter (dm)
  - 0.1 ($^1/_{10}$) of a meter
  - Roughly the width of your hand

READING A SI METRIC SYSTEM RULER

- Smallest marking or graduation is usually a millimeter (mm)
  - 10 millimeters = 1 centimeter
- Numbered markings is usually 1 centimeter (cm)
  - 10 centimeters = 1 decimeter (dm)

LS–A

Name _____

SI Metric System Measurements

Purpose

The purpose of this activity is to practice correctly measuring the length of a line and expressing that length in millimeter, centimeter, decimeter, and meter measures.

Objective

Correctly measure and record the length of a given line in millimeters, centimeters, decimeters, and meters.

Materials

- lab sheet
- metric ruler or tape measure with millimeter graduations
- writing utensil

Procedure

Using a metric ruler or tape measure, correctly measure and record the length of each line. Record your answer in terms of the millimeters, centimeters, decimeters, and meters as indicated.

1. The length of the line below is:

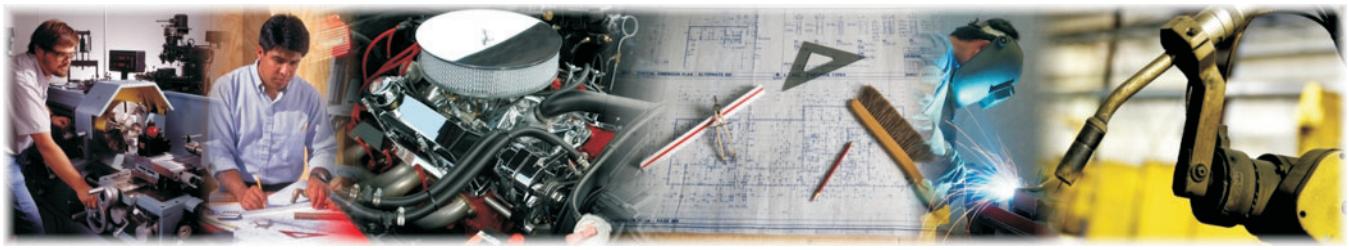
   _____

   _____ millimeters

   _____ centimeters

   _____ decimeters

   _____ meters



2. The length of the line below is:

_____ millimeters

_____ centimeters

_____ decimeters

_____ meters

3. The length of the line below is:

_____ millimeters

_____ centimeters

_____ decimeters

_____ meters

SI Metric System Measurements

1. 70 millimeters
   7 centimeters
   0.7 decimeters
   0.07 meters

2. 95 millimeters
   9.5 centimeter
   0.95 decimeters
   0.095 meters

3. 20 millimeters
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