

4•9

Personal References for Metric Length



Objective To assist students as they establish personal references for metric units of length.

1 Teaching the Lesson

Key Activities

Students find personal references (parts of their bodies or other objects) to help them estimate lengths of 1 centimeter, 10 centimeters, and 1 meter.

Key Concepts and Skills

- Identify personal references for metric units of length. [Measurement and Reference Frames Goal 1]
- Estimate, without tools, the length of objects or distances in centimeters, decimeters, and meters. [Measurement and Reference Frames Goal 1]
- Measure the length of objects or distances in centimeters, decimeters, and meters. [Measurement and Reference Frames Goal 1]

Key Vocabulary

personal measurement reference

materials

- Math Journal 1*, pp. 56, 98, and 99
- Student Reference Book*, p. 130
- Study Link 4•8
- *, / Fact Triangles
- tape measure
- ruler
- meterstick

See Advance Preparation

2 Ongoing Learning & Practice

Students play *Number Top-It* (Decimals) to practice comparing and ordering decimals.

Students practice and maintain skills through Math Boxes and Study Link activities.

Ongoing Assessment: Recognizing Student Achievement Use *Math Masters*, page 506. [Number and Numeration Goal 6]

materials

- Math Journal 1*, p. 100
- Student Reference Book*, p. 256
- Study Link Master (*Math Masters*, p. 131)
- Game Masters (*Math Masters*, pp. 491 and 506)
- number cards 0–9 (4 of each; from the Everything Math Deck, if available)

3 Differentiation Options

READINESS

Students explore relative sizes of metric units.

ENRICHMENT

Students make up clues for a measurement scavenger hunt.

EXTRA PRACTICE

Students solve problems involving metric measurements.

materials

- Teaching Master (*Math Masters*, p. 132)
- 5-Minute Math*, pp. 48 and 49
- tape measure; ruler; meterstick

Additional Information

Advance Preparation For the Math Message, choose something in the classroom that measures between 30 and 60 centimeters in length or height. Measure the object, rounding to the nearest 10 centimeters. Use the measurement to complete the Math Message.

Technology

Assessment Management System
Math Masters, page 506
See the iTLG.



Getting Started

Mental Math and Reflexes



Students use their Multiplication/Division Fact Triangles to practice the facts in the Try Again pile. They transfer appropriate triangles to the OK pile, color the OK facts in the table on journal page 56, fasten their new piles with paper clips, and store them.

Math Message



Without measuring, try to find something in the classroom whose length or height is about (fill in the measurement of the object you chose) centimeters. Be ready to explain how you made your choice.

Study Link 4-8 Follow-Up



Briefly go over the answers. If there is disagreement, have students measure the line segments again.

1 Teaching the Lesson

Math Message Follow-Up



Working in small groups, have students name the objects they chose and share how they made their decisions. Now, or at some later time, they should measure the objects to see how close their estimates are. Ask: *Did anyone choose the same object you chose?*



Adjusting the Activity

Have students solve problems that involve more than one measurement. For example: *I'm thinking of an object that is about x centimeters high and about y centimeters long. What object might I be thinking of?*

AUDITORY ♦ KINESTHETIC ♦ TACTILE ♦ VISUAL

Student Page

Measurement

Personal References for Units of Length

Sometimes it is hard to remember just how long a centimeter or a yard is, or how a kilometer and a mile compare. You may not have a ruler, yardstick, or tape measure handy. When this happens, you can estimate lengths by using the lengths of common objects and distances that you know.

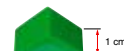
Some examples of personal references for length are given below. A good personal reference is something that you often see or use, so you don't forget it. A good personal reference also does not change size. For example, a wooden pencil is not a good personal reference for length, because it gets shorter as it is sharpened.



The diameter of a quarter is about 1 in.



The thickness of pattern blocks is about 1 cm.



Personal References for Metric Units of Length

About 1 millimeter	About 1 centimeter
Thickness of a dime	Thickness of a crayon
Thickness of a thumbtack point	Width of the head of a thumbtack
Thickness of a paper match (the thin edge)	Thickness of a pattern block

About 1 meter	About 1 kilometer
One big step (for an adult)	1,000 big steps (for an adult)
Width of a front door	Length of 10 football fields (including the end zones)
Tip of the nose to tip of the thumb, with arm extended (for an adult)	

Note
The personal references for 1 meter can also be used for 1 yard. 1 yard equals 36 inches. 1 meter is about 39.37 inches. One meter is often called a "fat yard," which means one yard plus one hand width.

Personal References for U.S. Customary Units of Length

About 1 inch	About 1 foot
Length of a paper clip	A man's shoe length
Width (diameter) of a quarter	Length of a license plate
Width of a man's thumb	Length of this book

About 1 yard	About 1 mile
One big step (for an adult)	2,000 average-size steps (for an adult)
Width of a front door	Length of 15 football fields (including the end zones)
Tip of the nose to tip of the thumb, with arm extended (for an adult)	

Did You Know?
Recently, the tallest man in the world was measured at 7 ft 8.9 in. (2,359 m) in Tunisia.

Student Reference Book, p. 130

Introducing Personal Measurement References



(Student Reference Book, p. 130)

Read page 130 in the *Student Reference Book* as a class. Discuss why **personal measurement references** might be useful. Reasons might include the following:

- It is hard to remember how long a centimeter or a foot is, how much area a square yard takes up, or how heavy a pound feels. Relating measures to common objects makes it easier to remember their relative sizes.
- Sometimes we need to measure something but don't have a tool. Personal measurement references can be used to estimate the unknown measurement.

Tell students that in this lesson they will look for personal references for 1 centimeter, 10 centimeters (1 decimeter), and 1 meter. Students will use their personal references to estimate the measurements of various objects.



Adjusting the Activity

ELL

Discuss the mathematical and everyday meanings of the term *reference*. For example:

- ▶ The class uses a *Student Reference Book*.
- ▶ Today students will find personal measurement references.

AUDITORY ♦ KINESTHETIC ♦ TACTILE ♦ VISUAL

Finding Personal References for Metric Units of Length

(*Math Journal 1*, p. 98)



PARTNER ACTIVITY

Determining personal references for 1 centimeter and 10 centimeters

Students use metric rulers or tape measures to find common objects that are about 1 centimeter and 10 centimeters in length. Have them select one or two objects and record them in the Personal References Table on the top half of journal page 98. (The table for U.S. customary units of length on the bottom half of the page will be completed in Lesson 5-1.)

Encourage each student to find his or her own objects so that the references will be personal. Stress that students should look for objects that are easy to find and that are available when needed. Body parts are ideal, although these references will change over time. The idea is to use objects that can help students develop a sense of the sizes of the units and that can help students estimate lengths in metric units when a ruler is not available.

Point out that the objects students choose as personal references must maintain their lengths. Therefore, a pencil would not be a good choice since it will be shorter after it has been sharpened. Have students share their choices.

Determining personal references for 1 meter

This may be more difficult than it appears. Many items commonly used in the United States, such as furniture and building materials, are manufactured to specifications in inches and feet. As a result, few objects end up being exactly 1 meter in length. Thus, students may have to settle for objects that are a little more or less than 1 meter.

Two approaches are recommended:

- ▶ If you have enough metersticks or metric tape measures, have students explore the classroom with their partners, looking for objects or spaces that are about 1 meter in length. Have students record and share their results.
- ▶ Alternatively, have students propose possible objects or spaces while seated. Ask students if they think the proposed object or space is more or less than 1 meter in length. Then measure the object or space yourself.

Student Page

Date

Time

LESSON 4•9

Personal References for Units of Length

Personal References for Metric Units of Length

Use a ruler, meterstick, or tape measure to find common objects that have lengths of 1 centimeter, 1 decimeter, and 1 meter. The lengths do not have to be exact, but they should be close. Ask a friend to look for references with you. You can find more than one reference for each unit. Record the references in the table below.



Unit of Measure	Personal References
1 centimeter (cm)	
1 decimeter (dm), or 10 centimeters	
1 meter (m)	

To be completed in Lesson 5-1.

Personal References for U.S. Customary Units of Length

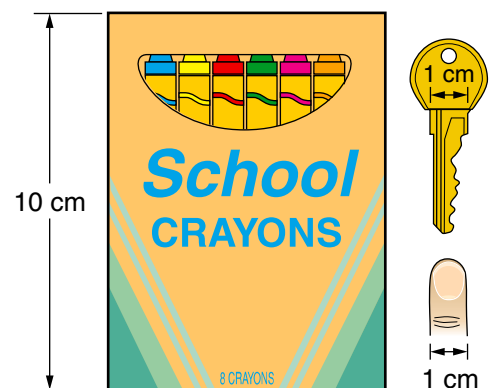
Use a ruler, yardstick, or tape measure to find common objects that have lengths of 1 inch, 1 foot, and 1 yard. The lengths do not have to be exact, but they should be close. Ask a friend to look for references with you. You can find more than one reference for each unit. Record the references in the table below.

Unit of Measure	Personal References
1 inch (in.)	
1 foot (ft)	
1 yard (yd)	

Math Journal 1, p. 98

NOTE If students have difficulty finding objects, here are some possibilities:

- 1 cm width of a fingertip
- width of the stem of a house key
- 10 cm height of a crayon box
- length of a paper clip (straightened out)



2 Ongoing Learning & Practice

▶ Playing *Number Top-It* (Decimals)



PARTNER
ACTIVITY

(Student Reference Book, p. 256; Math Masters, pp. 491 and 506)

Students play *Number Top-It* (Decimals) to practice comparing and ordering decimals. See Lesson 4-4 for additional information.

Ongoing Assessment: Recognizing Student Achievement

Math Masters,
Page 506

Use the *Number Top-It* (Decimals) Record Sheet (Math Masters, page 506) to assess students' ability to compare decimals through thousandths. Students are making adequate progress if they are able to record rounds of *Number Top-It* (Decimals) with number sentences using $>$ and $<$ correctly. Some students may be able to order decimals to thousandths.

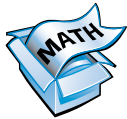
[Number and Numeration Goal 6]

▶ Math Boxes 4-9



INDEPENDENT
ACTIVITY

(Math Journal 1, p. 100)



Mixed Practice Math Boxes in this lesson are paired with Math Boxes in Lesson 4-6. The skill in Problem 5 previews Unit 5 content.



Writing/Reasoning Have students write a response to the following: *Explain the strategy you used to order the decimals in Problem 2.* **Sample answer:** First I wrote the

four decimals vertically and aligned them by the decimal points. Then I checked the values of the digits in the ones place, tenths place, and hundredths place of each number to write the decimals from smallest to largest.

▶ Study Link 4-9



INDEPENDENT
ACTIVITY

(Math Masters, p. 131)



Home Connection Students use personal references to estimate the lengths of objects, and then they measure each object. Students convert between metric measures.

Encourage students to continue bringing examples of decimals to display in the Decimals All Around Museum.

Student Page

Date _____ Time _____

LESSON
4-9
Math Boxes

1. Solve mentally or with a paper-and-pencil algorithm.

a. $\$12.63 + \$5.66 =$ \$18.29 b. $\$2.46 - \$1.34 =$ \$1.12
 c. $9.6 - 4.8 =$ 4.8 d. $0.64 + 0.47 =$ 1.11

2. Put these numbers in order from smallest to largest.
 1.68 0.78 6.71 0.61
0.61 0.78 1.68 6.71

3. The great spotted kiwi bird is about 114.3 centimeters tall. The greater rhea is about 137.1 centimeters tall. How much taller is the greater rhea than the great spotted kiwi bird?
22.8 centimeters

4. Make up a set of 7 numbers having the following landmarks:
 mode: 21
 median: 24
 maximum: 35
 range: 20 **Sample answer:**
15 21 21 24 28 30 35

5. Write the following numbers using digits:
 a. four hundred eighty-two thousand, one hundred ninety-seven
482,197
 b. eight hundred million, twelve thousand, five
800,012,005

Math Journal 1, p. 100

Study Link Master

Name _____ Date _____ Time _____

STUDY LINK
4-9
Metric Measurements

1. Use your personal references to estimate the lengths of 4 objects in metric units. Then measure each object. Record your estimates and measurements.

Object	Estimated Length	Actual Length
Answers vary.		

Complete.

2. 18 cm = 180 mm 3. 4 cm = 40 mm
 4. 3 m = 3,000 mm 5. 4 m = 400 cm
 6. 7 m = 700 cm 7. 4.6 m = 460 cm
 8. 7.94 m = 794 cm 9. 4.5 m = 450 cm
 10. 0.23 m = 23 cm 11. 0.6 m = 60 cm

Measure each line segment to the nearest $\frac{1}{2}$ cm.

12. _____
 About 8.5 centimeters

13. _____
 About 7 centimeters

Practice

Insert $<$ or $>$.

14. 0.68 $>$ 0.32 15. 9.13 $>$ 9.03 16. 0.65 $>$ 0.6

Math Masters, p. 131

Teaching Master

Name _____ Date _____ Time _____

LESSON
4-9

Matching Metric Units

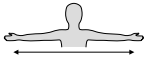
Metric Units of Linear Measure	
millimeter (mm)	decimeter (dm)
centimeter (cm)	meter (m)

1. Write the abbreviation for the correct unit after each measurement below.

- a. A crayon is about 85 mm long. b. A thumb is about 2 cm across.



- c. An arm span is about 110 cm. d. A journal is about 280 mm long.



- e. The height of your table or desk is about 7 dm. f. A door opening is about 1 m wide.



2. Describe any patterns you see in the measurements and units above.

Sample answer: Larger things are measured in meters and decimeters, and smaller things are measured in centimeters and millimeters.

3. Make up 2 examples of your own. Measure the objects in a unit of your choice.

Answers vary.

Math Masters, p. 132

3 Differentiation Options

READINESS

PARTNER
ACTIVITY

▶ Matching Metric Units

5–15 Min

(*Math Masters*, p. 132)

To explore relative sizes of metric units, have students match units to measurements. Ask them to refer to the actual objects listed on *Math Masters*, page 132 so students can measure them to decide which unit should be used.

ENRICHMENT

SMALL-GROUP
ACTIVITY

▶ Designing a Measurement Scavenger Hunt

30+ Min



To apply students' understanding of metric units of linear measure, have them create a scavenger hunt for other students or another class. You might suggest the following procedure:

1. Begin by using personal references to estimate the size of objects.
2. Use a meterstick to check estimates.
3. Write the measure of each object as the first clue.
4. Then write a second clue—something that will help limit the possible choices. *For example:*
 - ▷ This object is about 2 meters high. You wouldn't be able to get into the classroom without it. **door**
 - ▷ This object is about 15 centimeters long. It is useful to have around when solving problems with large numbers. **calculator**

Have students read their clues aloud.

EXTRA PRACTICE

SMALL-GROUP
ACTIVITY

▶ 5-Minute Math

5–15 Min

To offer students more experience with metric measurements, see *5-Minute Math*, pages 48 and 49.