9.1 Measuring with Yards and Meters

Objectives To provide review for the concept of nonstandard units of measure; and to introduce yard and meter.

1 Teaching the Lesson

Key Concepts and Skills
- Estimate and measure using nonstandard measurement units.
- Develop an understanding of the importance of standard units.
- Measure using a meterstick.

Key Activities
Children find the length of a classroom wall by using their heights and by measuring with a meterstick. Children also compare a yardstick and a meterstick.

Ongoing Assessment: Recognizing Student Achievement
Use Mental Math and Reflexes.
[Data and Chance Goal 2]

Ongoing Assessment: Informing Instruction
See page 663.

Key Vocabulary
standard unit ● yard ● meter

Materials
Math Journal 2, p. 209
Math Masters, p. 415
Class Data Pad (optional) ● stick-on notes ● yardstick ● meterstick ● floor covering (optional)

Advance Preparation
For Part 1, the yardstick and meterstick need to be two separate measuring tools. The yardstick should be 36 inches long, not 39 inches as on the back of a meterstick. For the Measuring Length with a Nonstandard Unit activity, children lie down on part of the classroom floor. You may want to cover this part of the floor with blankets or a rug. For the optional Enrichment activity in Part 3, use masking tape to create 3 crooked paths of different lengths on the floor. Each path should be about 2 yards long. Label the paths A, B, and C. For a mathematics and literacy connection, obtain a copy of How Big Is a Foot? by Rolf Myller (Dell Publishing, 1991).

2 Ongoing Learning & Practice

Comparing Measurements
Math Journal 2, p. 210
per partnership: meterstick, tape measure, ruler
Partners measure and compare height, head size, and shoe length.

Math Boxes 9–1
Math Journal 2, p. 211
Children practice and maintain skills through Math Box problems.

Home Link 9–1
Math Masters, p. 252
Children practice and maintain skills through Home Link activities.

3 Differentiation Options

READINESS
Measuring Length with a Nonstandard Unit
Math Masters, p. 253
large and small paper clips
Children gain experience with nonstandard units of measure by using small and large paper clips to measure lines.

ENRICHMENT
Comparing Crooked Paths
Math Masters, p. 254
per partnership: masking tape, string, scissors, yardstick, meterstick, tape measure
Children estimate, measure, and compare the lengths of three crooked paths.

ELL SUPPORT
Building a Math Word Bank
Differentiation Handbook, p. 142
Children add the terms yard and meter to their Math Word Banks.

Teacher’s Reference Manual, Grades 1–3 pp. 157, 158

660 Unit 9 Measurement
Getting Started

Mental Math and Reflexes ★

Write the following sets of numbers on the board. On an Exit Slip (Math Masters, page 415), ask children to find the mode (the most popular number) for each set of numbers. Suggest that children first put the sets in ascending or descending order.

- 3, 6, 2, 9, 0, 8, 2
- 13, 14, 8, 6, 13, 18, 18, 12, 18, 9
- 54, 52, 89, 34, 61, 89 61 and 89

Math Message

About how many children in our class can lie head-to-foot along the longest wall of our classroom? Write your estimate on a stick-on note. Write large! Keep your stick-on note.

Ongoing Assessment: Recognizing Student Achievement

Use Mental Math and Reflexes to assess children’s ability to find the mode (the most popular number). Children are making adequate progress if they can find the mode for the first two sets after arranging the numbers in ascending or descending order.

[Data and Chance Goal 2]

1 Teaching the Lesson

Math Message Follow-Up

Put children’s estimates in order by having them bring their stick-on notes to the board or Class Data Pad. Have children find the median (middle value) of the estimates. Summarize the activity by saying: Our class estimate of the length of the classroom is ___ second graders. Discuss what it means to estimate the number of units in a specific length. To make an estimate, one uses a mental picture of the unit and imagines how many units would match the length.

Measuring Length with a Nonstandard Unit

Ask volunteers to measure the length of the classroom. Have children lie head-to-foot along the longest side of the classroom.

1. The first child lies on the floor with his or her feet at one end of the room.
2. The second child lies down head-to-head next to the first child, the third child lies down feet-to-feet next to the second child’s feet, and so on.

Tell children that the length of the classroom could be given as ___ second graders long. Because second graders are different sizes, however, suggest measuring the length of the classroom using only one child.
Ask for a volunteer. Select someone who is neither the shortest nor the tallest child in the class. Measure the length of the classroom using the volunteer as the unit.

1. The child lies on the floor with his or her feet at one end of the room.

2. Use the corner of a yardstick to mark the place at the top of the child’s head while the child gets up and moves. Mark the second length and so on.

The class keeps a count as the volunteer moves along the length of the classroom. Tell children that the length of the classroom could be given as ___ (number) ____ (child’s name given in plural) long.

Ask the class: How could we tell someone in another city or state how long our classroom is? Discuss some of the difficulties with using people as a unit of measure:

- Unless the same person is used each time, we may get a different measurement each time we measure.
- Even if only one person is used to measure, we can’t take that person with us whenever we want to measure something. Besides, the person will grow, so the measurement will change.

A standard unit is a unit of measure that has been defined by a recognized authority such as a government or standards organization. If different people measure the same object using the same standard unit, they will get the same measurement.

**Introducing Yard and Meter as Standard Lengths**

Children have previously used the standard units of inch and centimeter to measure length. Inches and centimeters are good for measuring short lengths. For longer lengths, such as the length of the classroom, there are other standard units that can be used.

Talk about the stick you used earlier as a marker when measuring the length of the room with a person. In the U.S. customary system, a yard is 36 inches long. To support English language learners, display a yardstick and write “A yard is 36 inches long.” on the board. Discuss the everyday and mathematical meanings of the word yard. A yard makes it easier to measure longer lengths, and it is a standard unit of measure that is used by most people in the United States.
In the metric system, the most commonly used standard unit of length that is longer than a centimeter is a meter. Write “A meter is 100 centimeters long.” on the board. Show the class a meterstick. Compare it to a yardstick.

**NOTE** In the metric system, all the linear units are defined in terms of a meter.

Both the metric system and the U.S. customary system are used in the United States. The U.S. customary system is used for everyday purposes; the metric system is used for science and industry. Most labels on canned and packaged food show both metric and U.S. customary units of measure. Most of the other countries in the world use only the metric system.

Talk about lengths and distances that might be measured in yards or meters. Some examples include the length of a hallway, the width of a playground, the length and width of a piece of fabric, the distance traveled by runners in a race, the distance an object is thrown in sports, and various lengths marked on sports fields.

### Checking Estimates by Measuring Distances with Metersticks

*(Math Journal 2, p. 209)*

Standing near the longest wall of the classroom, hold up a meterstick and ask children to estimate the length of the wall in meters. Then use the meterstick to measure that same distance to the nearest meter. Compare the estimate to the measurement in meters.

On the journal page, children select distances in or near the classroom, estimate the number of meters for each distance, and then measure each distance using a meterstick. When children measure with a meterstick, they should measure to the nearest meter. You may wish to have children measure several distances before assigning the journal page so you can observe that they are measuring correctly.

### Links to the Future

The activities in this lesson expose children to the relationships between inches and yards and between centimeters and meters. Children will continue this exploration of relationships between units of measure in third grade. Describing relationships between the two systems is a Grade 4 Goal.

### Adjusting the Activity

Have children measure the distances with a yardstick. Ask children whether the number of yards would be larger or smaller than the number of meters when measuring distances such as a long hallway or large playground. Because a meter is a larger unit than a yard, the number of meters would be smaller than the number of yards.

### Ongoing Assessment: Informing Instruction

Watch for children who are hesitant to make estimates. Some will try to avoid doing so by measuring first and then recording a number close to the actual measurement as their “estimate.” Others will estimate first and then measure. However, they will then erase their first estimate and record a new “estimate” that is closer to the actual measurement. To avoid these problems and to get a more accurate assessment of a child’s ability to estimate, ask children to record each estimate in pen before measuring the distance with a meterstick.

### Math Journal 2, p. 209

<table>
<thead>
<tr>
<th>Distance</th>
<th>Estimated</th>
<th>My Estimate</th>
<th>My Meterstick Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>about ___ meters</td>
<td>about ___ meters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>about ___ meters</td>
<td>about ___ meters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>about ___ meters</td>
<td>about ___ meters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>about ___ meters</td>
<td>about ___ meters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>about ___ meters</td>
<td>about ___ meters</td>
<td></td>
</tr>
</tbody>
</table>

Answers vary.
Ongoing Learning & Practice

Comparing Measurements
(Math Journal 2, p. 210)

Partners measure their height, head size, and shoe length in centimeters and find the difference in their measurements. Children will use the head-size data in Lesson 11-3.

Math Boxes 9-1
(Math Journal 2, p. 211)

Mixed Practice Math Boxes in this lesson are paired with Math Boxes in Lesson 9-3. The skill in Problem 6 previews Unit 10 content.

Writing/Reasoning Have children draw, write, or verbalize their answers to the following: Explain how you found the median in Problem 4. Sample answer: I put the numbers in order and found the middle number.

Home Link 9-1
(Math Masters, p. 252)

Home Connection Children discuss how measurements are used at home, at work, or during other activities. They bring in pictures of items labeled with measures and small boxes shaped like rectangular prisms. The boxes will be used in Lesson 9-4.
Materials:  
- small paper clips
- large paper clips

Directions:
1. Use small paper clips to measure the line below. About how many small paper clips?
2. Try again. Measure this line with small and large paper clips. About how many small paper clips?
3. Why are the measurements different for the same line? Sample answer: Because the units are different lengths.

**LESSON 9**

Name Date Time

Measuring Length with Paper Clips

Math Masters, p. 253

Teaching Master

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DIFFERENTIATION OPTIONS**

**READINESS**

- Measuring Length with a Nonstandard Unit
  *(Math Masters, p. 253)*

To provide experience with nonstandard units of measurement, have children use small and large paper clips to measure lines on Math Masters, page 253. Children explain why the measurements are different.

**ENRICHMENT**

- Comparing Crooked Paths
  *(Math Masters, p. 254)*

To apply children’s understanding of estimating length, have them compare the lengths of three crooked paths. Children work with a partner to develop and carry out a strategy for comparing the paths you have prepared. *(See Advance Preparation.)* Have measuring tools, string, and scissors available. Sample strategies: “straighten” each of the paths by cutting a piece of string to model the length and then make a direct comparison. Take a piece of string longer than any of the paths and mark off the total length of each path. Use a yardstick to measure each piece of the crooked paths and add the measurements. When they have finished Math Masters, page 254, have children discuss and compare their strategies.

**ELL SUPPORT**

- Building a Math Word Bank
  *(Differentiation Handbook, p. 142)*

To provide language support for measurement, have children use the Word Bank template found on Differentiation Handbook, page 142. Ask children to write yard and meter, draw a picture representing each term, and write other related words. See the Differentiation Handbook for more information.

**Planning Ahead**

For Lesson 9-2, gather the items for the Measures All Around Museum.