



San Diego Unified School District

Instructional Module to Enhance the Teaching of

H A R C O U R T

Math

California Edition

Grade 3

Module 8 – Revised

Unit 8: Measurement

– WORK IN PROGRESS –

San Diego City Schools
Instruction and Curriculum Division
GRADE 3 – MATHEMATICS CURRICULUM MAP

MODULE 8 – MEASUREMENT

Modules represent individual units of study that lead to essential learnings

THREADS THROUGHOUT THE YEAR:

The threads represent ongoing learning opportunities in which students should be actively engaged throughout all units of inquiry during the entire school year. These items should not be isolated to any one particular unit of inquiry.

Students will:

- Develop understanding of numbers and the number system and use their understanding to solve problems and recognize reasonable results.
- Develop understanding of and fluency in basic computation and procedural skills.
- Use mathematical reasoning to solve problems.
- Communicate their mathematical thinking by using words, numbers, symbols, graphs and charts.
- Use equations and variables to express generalizations of patterns and relationships.
- Develop logical thinking to analyze evidence and build arguments to support or refute a hypothesis.
- Make connections among mathematical ideas and between other disciplines.
- Develop and use strategies, skills, and concepts to solve problems.
- Use appropriate tools, including technology, as vehicles to learn mathematical concepts.

These are essential learnings that represent bigger ideas/concepts:

- Students understand that measurement involves comparing an item with a measurement unit that has the same attribute: length with length; area with area, temperature to temperature.
- Students determine that arranging the shape of the same area does not change the area, but that rearranging the same perimeter affects the area.
- Students estimate using benchmarks and measure with tools that are more accurate, but never exact.
- Students explore and describe relationships between perimeter and area and generalize strategies for finding perimeter and area of rectangles.

These are essential questions that learners ask themselves in order to achieve the essential learnings:

- How do I estimate and measure using appropriate benchmarks and customary units to find: length, distance, capacity, weight, mass and temperature?
- How do I develop and use efficient strategies for converting units within customary systems of measurement?
- How do I show the relationship between perimeter, area, surface area and volume?
- What are efficient strategies to estimate and calculate perimeter, area, surface area and volume?
- How do I develop and use generalizations about area and perimeter to solve problems?
- How do I show and explain that measurement is a comparison and is never exact?

****Presented in previous grade(s)***

Resources: Van de Walle: Chapter 19 (pp. 316-327); *Mathematics Source Book: Measurement* (pp.27-36)

UNIT 8: Measurement
MODULE 8 – 4 Weeks of Instruction

Key Mathematical Concepts:

- Understand how to measure; develop “benchmarks” and choose appropriate customary units to measure: length, distance, capacity, weight, mass, and temperature.
- Know how to estimate measurements and use tools to measure and find: length, distance, capacity, weight, mass, and temperature.
- Understand and use efficient strategies for converting units within customary systems of measurement.
- Understand that measurement is a comparison.
- Understand that measurement is never exact – the accuracy depends on the precision and use of the tool.
- Understand the relationships between units within measurement systems.
- Understand how to estimate and figure perimeter, area, surface area, and volume.
- Develop and use *generalizations* about area and perimeter to solve problems.

<p><u>Chapter 24: CUSTOMARY UNITS</u></p> <p>Lesson 24.1: Length Lesson 24.2: Inch, Foot, Yard, and Mile Lesson 24.3: Capacity Lesson 24.4: Hands On: Weight Lesson 24.5: Ways to Change Units Lesson 24.6: Algebra: Rules for Changing Units Lesson 24.7: Problem Solving Skill: Use a Graph</p>	<p><u>Chapter 25: METRIC UNITS</u></p> <p>Lesson 25.1: Length Lesson 25.2: Problem Solving Strategy: Make a Table Lesson 25.3: Problem Solving Strategy: Make a Table Lesson 25.4: Hands On: Mass-Grams & Kilograms Lesson 25.5: Hands On: Measure Temperature</p>
<p><u>Chapter 26: PERIMETER, AREA, VOLUME</u></p> <p>Lesson 26.1: Hands On: Perimeter Lesson 26.2: Estimate and Find Perimeter Lesson 26.3: Area of Plane Figures Lesson 26.4: Area of Plane Figures Lesson 26.5: Problem Solving Skill: Make Generalizations Lesson 26.6: Estimate and Find Volume</p>	

GRADE 3
Harcourt Mathematics

MODULE 8: MEASUREMENT
Unit 8: 3.5 Weeks of Instruction

<p><u>Day 1</u> CHAPTER 24: <i>Customary Units</i></p> <p>Lesson 24.1: Length</p>	<p><u>Day 2</u></p> <p>Lesson 24.2: Inch, Foot, Yard, and Mile</p>	<p><u>Day 3</u></p> <p>Lesson 24.3: Capacity</p>	<p><u>Day 4</u></p> <p>Lesson 24.4: Hands On: Weight</p>	<p><u>Day 5</u></p> <p>Lesson 24.5: Ways to Change Units</p>
<p><u>Day 6</u></p> <p>Lesson 24.6: Algebra: Rules for Changing Units</p>	<p><u>Day 7</u></p> <p>Lesson 24.7: Problem Solving Skill: Use a Graph</p>	<p><u>Day 8</u> CHAPTER 25 <i>Metric Units</i></p> <p>Lesson 25.1: Length</p>	<p><u>Day 9</u></p> <p>Lesson 25.2: Problem Solving Strategy: Make a Table</p>	<p><u>Day 10</u></p> <p>Lesson 25.3: Problem Solving Strategy: Make a Table</p>
<p><u>Day 11</u></p> <p>Lesson 25.4: Hands On: Mass-Grams and Kilograms</p>	<p><u>Day 12</u></p> <p>Lesson 25.5: Hands On: Measure Temperature</p>	<p><u>Day 13</u> CHAPTER 26 <i>Area, Perimeter, Volume</i></p> <p>Lesson 26.1: Hands On: Perimeter</p>	<p><u>Day 14</u></p> <p>Lesson 26.2: Estimate and Find a Perimeter</p>	<p><u>Day 15</u></p> <p>Lesson 26.3: Area of Plane Figures</p>
<p><u>Day 16</u></p> <p>Lesson 26.4: Area of Plane Figures</p>	<p><u>Day 17</u></p> <p>Lesson 26.5: Problem Solving Skill: Make Generalizations</p>	<p><u>Day 18</u></p> <p>Lesson 26.6: Estimate and Find Volume</p>	<p><u>Day 19</u></p>	<p><u>Day 20</u></p>

DAY 1
Unit 8: Measurement
Chapter 24
LESSON 24.1, Pp. 420-423

MATERIALS:	Each student: two 1-inch by 12-inch construction paper strips and a ruler; masking tape for each group; Transparency 24.1; Routines: Performance Assessment 3.8A, Yarn Dolls – 1 per student.
LESSON FOCUS:	Length
CALIFORNIA STANDARDS:	Measurement and Geometry 1.0: Choose and use appropriate units and measurement tools to quantify the properties of objects. 1.1: Choose appropriate units and tools (metric and U.S.) and estimate and measure the length, liquid volume, and weight/mass of given objects. Mathematical Reasoning 2.3, 2.4, 2.5 Number Sense 2.8
PURPOSE OF LESSON:	Estimate/measure length to nearest inch and half-inch.
LAUNCH: Introduce students to concepts.	Check What You Know, P. 419: Discuss #s 2-5. (optional) How long is an inch? Foot? Yard? Discuss students' experiences/familiarity with measuring and units of length measurement. Record/chart student ideas.
EXPLORE: Work with the concept. Focus on students "doing" mathematics. <i>For each student: two 1-inch by 12-inch construction paper strips and a ruler; and masking tape for each group.</i>	Discuss: <ul style="list-style-type: none"> • Ask students to estimate the length of one of the paper strips. • Use a 12-inch ruler and compare to the strip. • Give students a paper strip and model as you guide them through the activity of making a ruler. • Prompt students to mark the inches on their strip: Make a mark at each end (left & right). • <i>What number should you put at the mark at the left end? (0)</i> • <i>At the mark at the right end? Record 12 to indicate 12 inches.</i> • Fold strip in half. Make a small line at the midpoint of the strip. • Discuss how to label the point. • Continue: Fold the strip in half again, make short lines on the folds. Decide how to label them (3 and 9). Remind students that they are marking inches and accuracy is important (all inches are the same size.) • Practice estimating: Students look at the numbers 0 and 3. • If you count by inches, what numbers are between 0 and 3? Discuss approximate location of the numbers. Students use a ruler to check. Students mark the points and label the numbers 1, 2, 4, 5, 7, 8, 10, 11 on strip. • Show students how to fold the <u>first inch in half</u>. Mark the midpoint. Check with their ruler.

	<ul style="list-style-type: none"> • Discuss what this mark shows. • Students make similar short lines between whole inches through 12, and use their rulers to check. • <i>Start at the left end.</i> Discuss how to read their rulers; 0 to 1 inch; 1 inch to 2 inches, and so on. • Students put their names on their rulers. <p>Alternative Teaching Strategy, P. 422: Use Steps 1-4. It isn't necessary to cut up the rulers to do the measurements. Students use inch rulers to measure items in the room. Share the results. Make a class chart of the items and measurements. Make a chart to record findings.</p>
PRACTICE: Focus on Communication and Representation.	<p>Practice & Problem Solving, P. 422-423: #s 23-28: Do with students. Share thinking.</p> <p>Practice & Problem Solving, P. 422: #s 9-18: Students do with a partner. Discuss solutions.</p>
SUMMARIZE: Connect purpose to activities.	<p>Assess, P. 423: DISCUSS.</p> <p>Assess, P. 423: WRITE. Students explain how to measure the length of their math book to the nearest inch or half inch.</p>
HOMEWORK:	Mixed Review and Test Prep, P. 423 #s 29-33.

ROUTINES:

Pp. PA64-66 and 68-70: Performance Assessment 3.8A: Yarn Dolls, in Performance Assessment Booklet.

Read problem with students. Make copies of page if students do not have booklets. Answer any questions.

Be encouraging... motivate, guide...

Be clear. Reword words or phrases and insert others as needed.

Be supportive. Assist students who need help.

Be fair. Allow students adequate time to do their best work.

Be flexible. All students will not do the task in the same order/way.

Involve students in the evaluating process.

Suggested responses are on PA68. Rubrics (3-point) are provided on Pp. PA69-70. Go over *Assessment* in next day's *Routines*.

DAY 2
Unit 8: Measurement
Chapter 24
LESSON 24.2, Pp. 424-425

MATERIALS:	Each student: Three 1x12-inch construction paper strips (2 of one color, 1 of another); rulers or yardsticks for students to share; masking tape; a 36" tape measure; *Routines: Transparencies of student work: <i>Performance Assessment 3.4: Yarn Dolls</i> .
LESSON FOCUS:	Inch, Foot, Yard, and Mile
CALIFORNIA STANDARDS:	Measurement and Geometry 1.0: Choose and use appropriate units and measurement tools to quantify the properties of objects. 1.1: Choose appropriate units and tools (metric and U.S.) and estimate and measure the length, liquid volume, and weight/mass of given objects. Mathematical Reasoning 2.3, 2.4
PURPOSE OF LESSON:	Choose appropriate unit, and estimate length and distance.
LAUNCH: Introduce students to concepts. <i>3 construction paper strips (12-inches x 1-inch) per student (2 of 1 color, 1 of another)</i>	<ul style="list-style-type: none"> • Use ruler from Lesson 24.1. Make 2 more rulers in different colors. • Students mark the two strips as they did in Lesson 24.1, using their 1-12 strip as a model. Review steps with students. • Label the second strip 12 inch strip (a different color), from 13 through 24. Label the first 12 inch strip (same color as first strip) from 25 through 36. • Explain that making the middle strip a different color makes it easier to measure. <p>Tape strips together in order to create a yardstick.</p>
EXPLORE: Work with the concept. Focus on students "doing" mathematics.	<p>Discussion Prompt:</p> <ul style="list-style-type: none"> • <i>How many feet long is your new tape measure? How do you know?</i> • <i>How many total inches long is it?</i> • <i>What is the name of a 3-foot ruler? (yard)</i> • Ask students to compare: Is 18" shorter than 2-feet? Explain. Is 24" equal to 2-feet? Continue with similar statements. • Students use tapes to measure items in the room. Share results. Identify items that should be measured in inches, in feet and those that need a yard tape. • <i>What unit of length do we use to measure distances? Example: What unit of length might you use to measure the distance from here to the ocean. Discuss.</i> <p>Learn, P. 424: Choose and Use. Read & discuss with students. Teach, P. 424; Guided Instruction questions to guide discussion.</p> <ul style="list-style-type: none"> • <i>Imagine 1 mile = 5,280 of your foot rulers placed end-to-end.</i> • Ask students to identify distances they think would be about 1 mile or more. Explain their reasoning. Chart responses. Chart: Items measured in inches, feet, and yards.

PRACTICE: Focus on Communication and Representation.	Practice & Problem Solving, P. 425: #s 12-16: Do with students.
SUMMARIZE: Connect purpose to activities.	Students list 4 units of U.S. measurement used to measure length and distance. Record one thing they would measure with each.
HOMEWORK:	Practice & Problem Solving, P. 425: #s 6-11 Mixed Review and Test Prep, P. 425 #s 19-23.

ROUTINES:

Review of Pp. PA64-66 and 68-70: Performance Assessment 3.8A: Yarn Dolls, in Performance Assessment Booklet.

Involve students in evaluating the *Performance Assessment, Yarn Dolls*, given the previous day.

Explain how papers are scored using rubrics. Share sample rubrics on pp. PA69-70. Ask why students think the 3 is scored the highest.

List paper's best points. Ask if anything important has been left out. Share the other two rubrics, one at a time, asking similar questions. Ask how each rubric could be improved.

Return papers to students. Ask how their papers are like the rubric scored 3 and how they are different. Talk about specific things they can do to improve their work. Help them edit and/or rewrite, if desired. Ask students what they learned from the experience. Discuss.

DAY 3
 Unit 8: Measurement
 Chapter 24
 LESSON 24.3, Pp. 426-427

MATERIALS:	Transparency 24.3; Various sizes of liquid containers larger than 1-quart (plastic tubs or buckets) and a 1-cup container for each group and teacher; one pint, quart, and gallon container so each group has one and teacher has a set; water. If conditions are not amenable to class use of water, have one large container of water (colored, if possible), and transparent containers. OR P. 426B: <i>Alternative Teaching Strategy.</i>															
LESSON FOCUS:	Hands On: Capacity															
CALIFORNIA STANDARDS:	Measurement and Geometry 1.4 1.0: Choose and use appropriate units and measurement tools to quantify the properties of objects. 1.1: Choose appropriate units and tools (metric and U.S.) and estimate and measure the length, liquid volume, and weight/mass of given objects. Mathematical Reasoning 2.3, 2.4															
PURPOSE OF LESSON:	Estimate and measure capacity using U.S. units.															
LAUNCH: Introduce students to concepts. <i>Per group: 1 large container and container with water.</i>	HW: Discuss P. 425: #s 6-11. (optional) <ul style="list-style-type: none"> • Give each group materials. • Ask students what they know about measuring liquids. • Discuss students' experience/understanding of measuring capacity. 															
EXPLORE: Work with the concept. Focus on students "doing" mathematics. <i>Measuring cup</i>	Show students a 1 pint size container. <ul style="list-style-type: none"> • Students estimate how much water (<i>rice or beans</i>) it takes to fill it <i>this container</i>. Discuss. Refer to markings on the measuring cup. • Each group selects a container larger than 1 cup and estimates the number of cups needed to fill it. Fill with water and record on chart. • Model filling the measuring cup and pouring it into the larger container. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Container</th> <th>Number of Cups Estimate</th> <th>Number of Cups Actual</th> </tr> </thead> <tbody> <tr> <td>Pint</td> <td></td> <td></td> </tr> <tr> <td>Quart</td> <td></td> <td></td> </tr> <tr> <td>Half-gallon</td> <td></td> <td></td> </tr> <tr> <td>Gallon</td> <td></td> <td></td> </tr> </tbody> </table>	Container	Number of Cups Estimate	Number of Cups Actual	Pint			Quart			Half-gallon			Gallon		
Container	Number of Cups Estimate	Number of Cups Actual														
Pint																
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	<ul style="list-style-type: none"> Record the number of cups used. Compare with estimates. Continue: estimating, filling, and recording the information. Extend to quarts as the unit of measure. <i>How many quarts in a gallon?</i> Estimate. Fill with quarts of water (beans/rice) until the gallon is full. Compare number of quarts to fill a gallon with number of cups in a gallon. Then the number of cups in each quart. Show and discuss representation: 4 quarts x 4 cups = 16 cups in a gallon. Add a column to the table for the Number of Quarts. <i>What patterns do you notice on the table?</i> Discuss. Continue with other containers. <p>Estimate and measure to determine the amount of water each holds.</p>
PRACTICE: Focus on Communication and Representation.	<ul style="list-style-type: none"> Try It, p. 426. Discuss with students. Connect, p. 427. Read & discuss with students. Practice, P. 427: #s 5-9: Do with students.
SUMMARIZE: Connect purpose to activities.	<ul style="list-style-type: none"> Students write and show how to find the number of cups in 3 pints and in 3 quarts. Share and discuss. Assess, p. 427: WRITE. Share possible strategies.
HOMEWORK:	<p>Practice, P. 427: #s 1-6</p> <p>Mixed Review & Test Prep., p. 427 #10-14.</p> <p>*Find several containers at home, e.g., empty milk cartons, soda cans/bottles, etc. Estimate and measure to find the number of cups of water each holds. Record type of container and number of cups.</p>

ROUTINES:**Skip Counting**

Begin skip counting and go around the class to see how far students can continue the pattern, e.g., say 4, 8, 12, and stop.

Go around the room asking each student to say the next number in the pattern. Use only single digits from 0 – 9 as the first number, e.g., 9, 18, 27, etc.

Students determine the last number of the counting pattern – depending on the number of students in the class.

Record counting patterns on the board.
Use 10 and its multiples if appropriate.

DAY 4
Unit 8: Measurement
Chapter 24
LESSON 24.4, Pp. 428-429

MATERIALS:	Classroom objects, balance or spring scale; items that weigh about 1 pound and 1 ounce, e.g., a pound of margarine, sugar, flour, an ounce of candy; cans with weights on their labels (cover weights with sticky notes) 9 pennies, 28 paper clips; Transparency 24.4
LESSON FOCUS:	Hands On: Weight
CALIFORNIA STANDARDS:	Measurement and Geometry 1.4 1.0: Choose and use appropriate units and measurement tools to quantify the properties of objects. 1.1: Choose appropriate units and tools (metric and U.S.) and estimate and measure the length, liquid volume, and weight/mass of given objects. Mathematical Reasoning 2.1, 2.3, 2.4 Number Sense 2.8
PURPOSE OF LESSON:	Estimate and measure weight.
LAUNCH: Introduce students to concepts.	HW: Practice, P. 427: Partner check and discuss #s 1-6. (optional) <ul style="list-style-type: none"> • Discuss strategies to find the weights of objects. • Pass around 1-pound objects. • Encourage students to get the “feel” of one pound. • Pass around cans or bags with a sticky note covering the weight on the labels. Students pick up each object, estimate weight, and compare actual weight to estimates. Record on a chart. Discuss.
EXPLORE: Work with the concept. Focus on students “doing” mathematics. <i>9 pennies and 28 paper clips</i>	Discuss which things in the room might weight about 1 pound. <ul style="list-style-type: none"> • Students find items in the room, estimate their weight, and use a scale to find the actual weight. • If a scale is not available, students compare by holding a known 1-pound item in one hand and an item, weight unknown, in the other. Ask students to keep a record of the items and relative weights. (chart) • Share items weighed, and list things weighing about 1 pound. • Discuss 1 ounce as a smaller unit than 1 pound. <i>Nine pennies weigh about 1 ounce.</i> <i>28 paper clips weigh about 1 ounce.</i> <i>2 tablespoons of water weigh about 1 ounce.</i> • Ask students to consider which things in the room might weigh about 1 ounce. • <i>Discuss, weigh some (or compare weights) items. Record items weighing about 1 ounce.</i>

	<p>Connect, top SE P. 429. Read with students.</p> <ul style="list-style-type: none"> • Discuss the number of 1-ounce objects needed to make 1 pound. • Students work in groups or pairs to find sets of objects or single objects weighing about 1 pound. Share. • Emphasize: 16 oz. = 1 pound.
<p>PRACTICE: Focus on Communication and Representation.</p>	<p>Practice, P. 429 #s 9 and 10: Discuss with students. Practice, P. 429: #s 1-4: Discuss with students.</p>
<p>SUMMARIZE: Connect purpose to activities.</p>	<ul style="list-style-type: none"> • Students explain which unit of measure they would use to find the weight of a bag of oranges and why. • Discuss items they measure in ounces. • Ask students how to convert pounds to ounces. Discuss strategies.
<p>HOMEWORK:</p>	<p>Practice, P. 429: #s 5-8 Mixed Review and Test Prep, p. 429 #s 12-16</p> <ul style="list-style-type: none"> • List: 5 items to weigh in ounces and 5 that would be weighed in pounds.

ROUTINES:**Name the Place**

Write and say a number, asking for the place of a given digit, e.g., 540.

In what place is the 5?

Use numbers through 9,999. Recording each number helps many learners. Vary by writing and saying a place value and a number from 0 through 9. Students answer with a number and the given number in the identified place.

For example, say: *thousands place, 2.*

Students can respond with any number having a 2 in the thousands place.

Extend by asking students to write their number in expanded notation.

Example: $2,461 = 2,000 + 400 + 60 + 1.$

